ASM REVIEW OF METAL LITERATURE 1949

REVIEW OF METAL LITERATURE

An Annotated Survey of Articles and Technical Papers Appearing in the Engineering, Scientific and Industrial Journals and Books, Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio.

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PREFACE

The A.S.M. Review of Current Metal Literature is a monthly feature of Metals Review, published by the American Society for Metals and distributed to its members. The present volume is a collection of the installments published in Metals Review from February 1949 through January 1950, and represents a complete survey of the metallurgical literature published during the period January through December 1949. It is the sixth volume in a series that began in 1944.

The annotations are not intended to serve as a substitute for a reading of the articles listed. They are brief abstracts designed to indicate the scope and content of the article so that the reader may determine whether it is something he wants to read in its entirety.

Attention is called to the table of contents immediately following and to the subject index starting on page 869. The table of contents lists the various subdivisions and classifications with explanatory notes on each; this classification is arranged primarily by processes and properties. The subject index has been prepared with the emphasis primarily on materials, although processes and properties are likewise indexed in detail in this section of the book. Subheads and cross-references are included in sufficient detail to permit the location of articles on any specific subject related to the metal industry. Indexing is based on the content of the article and not merely on the title.

In using the book, if the primary interest is in the broad field of corrosion, or foundry practice, or welding, turn immediately to the respective section as given in the table of contents. If the main interest is in aluminum alloys, or copper, or cast iron, turn to the corresponding heading in the subject index. If interest lies in specific aspects of corrosion, or a particular type of welding, these broad processes will be found broken down and subdivided in the subject index. An author index is also provided and a list of addresses of the journals and periodicals.

The actual preparation of the annotations has been under the direction of W. W. Howell, technical abstractor at Battelle Memorial Institute, assisted by Pauline Curry, N. W. Baklanoff, Fred

Rothfuss, and Leila M. Virtue, the last three working on foreign language abstracts. Proofreading, checking for accuracy, and other details of preparing the material for printing have been handled by Helen Lawton of the A.S.M. staff.

Marjorie R. Hyslop
Editor

May 1, 1950

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SECTION I

ORE BENEFICIATION and RESERVES

1A—General

1A-1. Notes on the Treatment of Pyrites Cinders at the Plant of the Pyrites Co., Inc., Wilmington, Delaware. R. C. Trumbull, W. Hardiek, and E. G. Lawford. *Bulletin of the Institution of Mining and Metallurgy,* Dec. 1948, p. 1-31.

Treatment of the roasting residues from Rio Tinto cupriferous pyrites. These residues contained 56-60% Fe; substantial amounts of Cu, Pb, and Zn; also some gold and silver. Chemistry of the various steps involved. Appendix describes and diagrams venturi-type solution heater.

1A-2. An Analysis: How to Improve the Metal Supply Situation. W. B. Griffin. *Modern Metals,* v. 4, Dec. 1948, p. 20-27.

Analysis of the situation existing with regard to each of the important metals; suggestions for conservation of scarce metals by substitution of others.

1A-3. A Mineral Policy for United States. Elmer W. Pehrson. *Metals,* v. 19, Dec. 1948, p. 9-10. Also *Mining and Metallurgical Society of America, Bulletin,* v. 41, Dec. 1948, p. 57-70; discussion, p. 70-76.

Recommended Course of Action.

1A-4. Beneficiation of Industrial Minerals by Heavy-Media Separation. G. B. Welker and C. F. Allen. *Mining Engineering,* v. 1, sec. 3, Jan. 1949, p. 17-26.

Advantages, scope, operations, applications, and equipment.

1A-5. Influence of Gases Liberated From Solution on Flotation of Minerals. (In Russian.) V. I. Klassen. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 991-998.

Basic conditions characterizing liberation of air from flotation suspensions. The possibility of direct flotation of minerals by air evolving from the solution is theoretically established. 17 ref.

1A-6. Crushing and Grinding. Lincoln T. Work. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 21-22.

Reviews 1948 literature. 19 ref.

1A-7. Flotation. J. Bruce Clemmer. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 41-44.

Reviews 1948 literature. 49 ref.

1A-8. Mineral Position of ECA Nations. No. 10. Great Britain. Frederick R. Brewster. **No. 11. Greece.** O. Perry Riker. *Engineering and Mining Journal,* v. 150, Jan. 1949, p. 61-66.

Continues series. (To be concluded.)

1A-9. Sink-Float Processes. John T. Sherman. *Chemical Engineering,* v. 56, Jan. 1949, p. 106-109, 114-115.

Developments in equipment and procedures. Predicts increasing utilization of such processes.

1A-10. Relationship Between Froth-Forming Properties and Size of Bubbles. (In Russian.) G. P. Mit'kevich. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, Aug. 1948, p. 816-819.

Proposes an optical method for studying the dynamics of the process of formation and disintegration of the mass of froth as a whole. The proposed method also permits determination of bubble sizes during the process.

1A-11. (Book). **Textures of the Ore Minerals and Their Significance.** A. B. Edwards. 185 pages. 1947. Australasian Institute of Mining and Metallurgy, Melbourne.

Significant ideas on origin of mineral textures and their application to geological and metallurgical problems. Solid solution phenomena in native metals, oxide minerals, and

sulfide, sulfo-salt minerals. Applications include ore geology and ore dressing.

1A-12. The Replenishment of Our Mineral Reserves. James Boyd. *Journal of American Zinc Institute,* v. 26, 1948, p. 43-51; discussion, p. 51-54.

Need for replenishment and recommendations.

1A-13. Laboratory Ore Testing Procedure. Clarence Thom and Frank A. Seeton. *Deco Trefoil,* v. 13, Jan.-Feb. 1949, p. 5-8.

Procedures and techniques to aid laboratory technicians in commercial, academic, and private ore-dressing laboratories.

1A-14. Minerals Beneficiation. J. F. Myers, E. H. Crabtree, and S. R. Zimmerly. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 66-71.

Annual review.

1A-15. Is Screening to Third Dimension Fully Developed? Owen H. Perry. *Mining Engineering,* v. 1, sec. 1, Mar. 1949, p. 17-19; discussion, p. 19, 24, 26.

In separating sapphire crystals for use as jewel bearings, the usual screening operation did not separate crystals which were too thin, although they were of proper diameter. Unique device designed to separate mechanically the desired thicknesses.

1A-16. Thickening—Art or Science? E. J. Roberts. *Mining Engineering,* v. 1, sec. 3, Mar. 1949, p. 61-64.

Theory and practice. Mathematics of the "teeter" zone and of the compression zone in thickeners and classifiers.

1A-17. Crushing Strengths of Minerals at Low Temperatures. James M. Weigle. *Science,* v. 109, Mar. 4, 1949, p. 229-230.

Effects of subnormal temperatures on the crushing strengths of several available common minerals. The changes from 25 to −183° C. were as follows: serpentine, +517%; prochlorite, +227%; selenite, +129%; graphite, +104%; and halite, −72%.

1A-18. Grundlegende und neuere Erkenntnisse bei der Feinmahlung von mineralischen Rohstoffen in Nasstrommelmühlen und ihre Anwendung in der Erzaufbereitung. (Fundamental Knowledge and Recent Developments in the Fine Wet Grinding of Minerals in Ball Mills and Its Use in Ore Dressing.) Gotthold Quittkat. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Jan. 1949, p. 6-14.

Theory of fine grinding and optimum conditions, such as size and hardness of the "milling balls" and rate of revolution of the mill. Different types of ball mills are described and illustrated.

1A-19. Bestämning av specifika ytan pa kross—och malgods enligt gaspermeabilitetsmetoden. (Determination of the Specific Surface of Finely Divided Materials by the Gas-Permeability Method.) Jonas Svensson. *Jernkontorets Annaler,* v. 133, no. 2, 1949, p. 33-86.

Theoretical basis of the method. Two different experimental arrangements were used, an apparatus of fairly conventional type and a completely closed apparatus in which permeability was determined with air as well as with nitrogen gas at pressures between 1 and 76 cm. Hg. Nineteen tests were made on finely divided quartz and a large number on sized material, ground products, and mixtures of ground products. 48 ref.

1A-20. Investigation of Muir Inlet or Nunatak Molybdenum Deposits, Glacier Bay, Southeastern Alaska. R. S. Sanford, G. A. Apell, and F. A. Rutledge. *U. S. Bureau of Mines,* Report of Investigations 4421, Mar. 1949, 6 pages. (TN21 Un3r).

Review of beneficiation tests.

1A-21. Investigation of Sweetsprings Manganese Deposits, Monroe County, W. Va., and Craig County, Va. Harold B. Ewoldt and Robert S. Sanford. *U. S. Bureau of Mines,* Report of Investigations 4433, Mar. 1949, 16 pages.

Beneficiation tests indicated that approximately 80% of material in crude ore could be discarded by log washing; that 55% of the total Mn was recoverable as a gravity concentrate averaging 34.6% Mn.

1A-22. Physical Properties of Mine Rock. Part I. S. L. Windes. *U. S. Bureau of Mines,* Report of Investigations 4459, Mar. 1949, 79 pages.

Physical and petrographic properties of over 100 rock types from operating mines or mineral-investigation projects. Apparent specific gravity; apparent porosity; compressive strength; flexural strength (modulus of rupture); impact toughness; abrasive hardness; scleroscope hardness; modulus of elasticity (Young's modulus); modulus of rigidity; specific damping capacity; and longitudinal bar velocity. Source and geologic identifications for each type, and petrographic descriptions. Applicability of the data to mining, crushing, and grinding.

1A-23. A Method for Polishing Sections of Ores. Edward Sampson. *Economic Geology and the Bulletin of the Society of Economic Geologists*, v. 44, Mar.-Apr. 1949, p. 119-127.

Grinding is in two stages on iron laps designed to maintain a flat surface as the lap wears. Polishing is done on a lead lap. Construction and operation of the machines and grades of abrasives and special mixtures of oils. A supplementary device holding a mounted specimen mechanically permits high pressure for polishing and greatly reduces polishing time for hard materials.

1A-24. Concentrating Minerals in Cast-Iron Spirals. Walter P. Gillingham. *Compressed Air Magazine*, v. 54, Apr. 1949, p. 91-93.

Simple, ingenious apparatus which effects gravity separation of materials much like nature does it at the bends of streams. Application to a variety of minerals and to coal.

1A-25. Simple Calculations, Based on These Graphs of Screen Analyses, Make It Easier to Rate Grinding Efficiencies. A. Legsdin and Frederick L. Schenck. *Engineering and Mining Journal*, v. 150, Apr. 1949, p. 88-89.

Rapid method based on new surface area produced per unit of power input.

1A-26. (Book) **Die Metallischen Rohstoffe, ihre Lagerungsverhältnisse und ihre wirtschaftliche Bedeutung. Heft 4. Kupfer. Heft 5. Mangan. Heft 6. Nickel und Kobalt.** (The Metallic Raw Materials, Their Properties, Behavior, and Economic Importance. Vol. 4. Copper. Vol. 5. Manganese. Vol. 6. Nickel and Cobalt.) Georg Berg and Ferdinand Friedensburg. 195, 235, and 280 pages. 1941, 1942, and 1944. Ferdinand Enke Verlag, Stuttgart, Germany. Reproduced 1947 by J. W. Edwards, Ann Arbor, Mich. $5.25, $6.50, and $7.00.

Information is provided in two parts in each of these books. Part I contains a brief account of properties; occurrence and origin; mining and dressing; metallurgical treatment; uses; history; marketing, evaluation, and prices; strategic importance; estimated future supplies; and statistics. Part II provides a comprehensive review of the occurrences of the metal in the individual countries throughout the world, location and general nature of the principal ore-bodies. Comparative geological and mineralogical information and statistical data.

1A-27. (Book) **Métallurgie: Elaboration des Métaux.** (Metallurgy: Production and Fabrication of Metals.) C. Chaussin and G. Hilly. 193 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France.

Various processes for obtaining pure or commercial ferrous and nonferrous metals—including ore treatments, smelting and refining in all their manifold variations. Furnace and other equipment.

1A-28. (Book) **Vorraete und Verteilung der mineralischen Rohstoff, Ein Buch zur Unterrichtung fuer jedermann.** (Resources and Distribution of Mineral Raw Materials, A Book for General Information.) F. Machatschki. 191 pages. 1948. Springer-Verlag, Vienna, Austria.

Heavy metals, light metals, precious metals, semi-metals, selenium and tellurium, rare earths, sulfur, arsenic, carbon, phosphorus, salts, and a short section on precious stones.

1A-29. (Book) **The Earth and Its Resources.** Ed. 2. Vernor C. Finch, Glenn T. Trewartha, and M. H. Shearer 584 pages. 1948. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y.

This textbook is for courses in physical geography and earth science. The atmosphere — weather and climate; landforms—plains, plateaus, hill country, and mountains; oceans and their shores; and earth resources—waters, vegetation, soils, and minerals.

1A-30. Laboratory Ore Testing Procedure. Part II. Clarence Thom and Frank A. Seeton. *Deco Trefoil*, v. 13, Mar.-Apr. 1949, p. 5-8.

Deals primarily with flotation test procedures.

1A-31. An Accounting of World Mining for 1948. Charles Will Wright. *Mining World*, v. 11, Apr. 15, 1949, p. 27-28, 30, 33-34.

A brief technological and economic survey of mining, mineral production, and ore beneficiation.

1A-32. Analyzer Aids Electrostatic Research. Shiou-Chuan Sun. *Engineering and Mining Journal*, v. 150, May 1949, p. 90-91.

The construction and operation of a distribution analyzer for electrostatic separation. Particles from the separator are collected in as many as 60 compartments instead of the former two or three.

1A-33 Industrial Minerals of Colorado. George O. Argall, Jr. *Quarterly of the Colorado School of Mines*, v. 44, Apr. 1949, 477 pages.

Entire issue is devoted to an extensive survey. Each material is treated under properties, uses, occurrences, production, mining and concentration, and marketing (including prices and freight rates).

1A-34. How You Can Predict Product Screen Analyses. E. J. Klovers. *Engineering and Mining Journal,* v. 150, June 1949, p. 80-81.

How estimated screen analyses of the products to be expected from a given crusher or grinding mill can be made with considerable accuracy when a screen analysis of the same material is available at a size not too far removed from that of the desired product.

1A-35. Untersuchungen uber die gunstigste Wichte von Mahltruben. (Investigations of the Optimum Specific Gravity of Ball Mill Sludge.) Gunther Flugge. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Feb. 1949, p. 43-47.

The best grinding effect is obtained with a sludge that has a considerably higher specific gravity than was previously assumed. Two formulas for determining the optimum specific weight of the sludge of any given ore.

1A-36. (Book) **Ore Genesis.** Ed. 1. John Stafford Brown. 204 pages. 1948. Hopewell Press, Hopewell, N. J.

Field of physical chemistry as applied to ore-forming substances. A new hypothesis as to the origin of ore deposits which the author believes fulfills requirements of an adequate theory better than currently accepted explanations. 139 ref.

1A-37. Jaw Crusher Capacities (Blake Type). D. H. Gieskieng. *Mining Engineering,* v. 1, sec. 3, July 1949 *(Mining Transactions,* v. 184), p. 239-246.

Tests made to check previously reported capacities; to study effects of various factors upon capacity, including jaw plate curvature; and to derive a general capacity equation. Such an equation, derived from results of these tests, is given with factors for its use.

1A-38. Pretreatment of Mineral Surfaces for Froth Flotation. S. A. Falconer. *Mining Engineering,* v. 1, sec. 3, July 1949 *(Mining Transactions,* v. 184), p. 247-255.

Treatment of ground mineral pulp before it enters the flotation machines. Such pretreatment changes the flotation characteristics of mineral surfaces to respond as desired to flotation. Physical methods, chemical methods, and a combination of the two are employed. 26 ref.

1A-39. Finsiktningsundersökningar. (Fine-Screening Investigations.) III. Bengt Fagerberg and Sture Mörtsell. *Jernkontorets Annaler,* v. 133, no. 4, 1949, p. 125-152.

Comparative investigation of drums and Traylor screens in screening magnetite concentrates on cloth with 0.15-0.40-mm. mesh openings. The tests also comprised a study of the influence of the dilution of the material, the number of revolutions, design of the drum, and inherent properties of the material to be screened.

1A-40. Radioactive Tracers in Mineral Engineering Problems and Particularly in Flotation. A. M. Gaudin and P. L. De Bruyn. *Canadian Mining and Metallurgical Bulletin,* v. 42, July 1949, *(Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), p. 331-337.

Fundamental properties of stable and unstable isotopes. C^{14} is being used as a tracer in flotation collectors and a broad study of tracers in mineral engineering. Ag^{110}, As^{74}, Sr^{90}, Ba^{140}, and S^{35} have been used to date. Details of methods. 13 ref.

1A-41. Studies on the Activation of Quartz with Calcium Ion. Strathmore R. B. Cooke and Marcus Digre. *Mining Engineering,* v. 1, Aug. 1949 *(Mining Transactions,* v. 184), p. 299-305.

Purpose of investigation was to determine those conditions under which dilute solutions of $CaCl_2$ will activate quartz for anionic flotation and to determine the amount of calcium ion absorbed by quartz. Primary variables such as Ca, Na and H ion concentrations, were studied. 14 ref.

1A-42. The Flotation of Quartz Using Calcium Ion as Activator. Strathmore R. B. Cooke. *Mining Engineering,* v. 1, Aug. 1949, *(Mining Transactions,* v. 184), p. 306-309.

Experiments using an improved type of cell for the bubble pick-up method devised by Cooke and Digre (see above abstract.) Presents evidence that fine quartz particles can adsorb Ca ions under conditions which prohibit large particles from doing the same.

1A-43. Energy—New Surface Relationship in Crushing. I. Application of Permeability Methods to an Investigation of the Crushing of Some Brittle Solids. J. N. S. Kwong, J. T. Adams, Jr., J. F. Johnson, and Edgar L. Piret. *Chemical Engineering Progress* (Engineering Section), v. 45, Aug. 1949, p. 508-516.

Crushing of quartz, fluorite, glass, labradorite, and a few other solids by dropping a steel ball on a piston resting on the material in a steel mortar. Surface areas were measured by the permeability method. 51 ref.

1A-44. Determination of Reflectivity of the Ore Minerals. R. E. Folinsbee. *Economic Geology and the Bulletin of the Society of Economic Geologists;* v. 44, Aug. 1949, p. 425-436.

Increasing sensitivity and reliability of exposure meters used in photography provides a simple and convenient method for the above. Relative reflecting powers of some 200 high-index nonopaque and opaque mineral species were determined with a General Electric exposure meter coupled to a metallographic microscope. Values obtained agree well. Reflecting powers of common species of opaque or nearly opaque native elements, sulfides, sulfosalts, and oxides are tabulated.

1A-45. Neue Aufbereitungs-Versuchsmaschinen. (New Ore-Dressing Testing Machines.) W. Gründer and H. Simon. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, May 1949, p. 139-144.

A new screen-clamping device, a triple-tube sorting device, hydroseparators for investigating sludge, experimental wet and air-settling equipment, a new "basket separator", a vacuum pyrometer, and experimental flotation cells.

1A-46. Viskositätsmessungen von Erztrüben. (Viscosity Measurements on Ore Sludges.) Günther Flugge. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, June 1949, p. 174-177.

Construction and operation of a stirrer viscosimeter which is useful for controlling grinding and classifying processes. It is claimed to be sufficiently accurate and more rapid than sieve analysis.

1A-47. Electrostatic Separation. Fred D. Kay. *Mining Congress Journal,* v. 35, Aug. 1949, p. 26-27, 51.

As applied to separation of rutile and zircon. Data are believed to be of value to producers treating ores that contain minerals having different electrical conductivities.

1A-48. Infra-Red Heater Lowers Concentrate Drying Costs. J. T. Hanvey, Jr. *Engineering and Mining Journal,* v. 150, Sept. 1949, p. 82-83.

Heater has been found effective and comparatively inexpensive in drying gravity and flotation concentrates. Treating 3-4 tons of high-grade concentrate per day, the heat lamps reduce its moisture content to less than 0.02% at a cost of $1.85 per ton.

1A-49. Aufschluss von Bauxit mittels dünner Sodalösungen und Gewinnung reiner Tonerde aus diesen Lösungen. (Dissolving Bauxite With Dilute Soda Solutions and Extracting Alumina From These Solutions.) W. Fulda. *Metall,* Dec. 1948, p. 397-399.

How the method differs from the Bayer process.

1A-50. Die Anwendung der Setzarbeit in der Erzaufbereitung. (The Use of Heavy-Density Media in Ore Dressing.) Franz Langer. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, July 1949, p. 205-210.

Reviews the literature. New heavy-density separators. 41 ref.

1A-51. Role of Gases and New Reagents in Flotation Processes. (In Russian.) I. I. Kurenkov. *Vestnik Akademii Nauk SSSR* (News of the Academy of Sciences of the USSR), Apr. 1949, p. 67-69.

Proceedings of meeting at which 15 papers covering all phases of flotation processes were presented.

1A-52. Mineral Beneficiation by Gravity Concentration; A Fundamental Study. Robert D. Carpenter. *Idaho Bureau of Mines and Geology* (Moscow, Idaho), Pamphlet No. 84, Apr. 1949, 16 pages.

An investigation of the capacity factor in gravity-concentration processes, particularly those processes in which mineral beneficiation is effected in washed, flowing pulp films on inclined surfaces.

1A-53. Preliminary Investigation of Concentrating Certain Minerals in Idaho Placer Sand. W. W. Staley and James S. Browning. *Idaho Bureau of Mines and Geology* (Moscow, Idaho), Pamphlet No. 87, June 1949, 23 pages.

A combination of screening, gravity methods, and magnetic separation for monazite, zircon, ilmenite, and magnetite. 15 ref.

1A-54. Ore-Dressing Notes. *Mining Magazine,* v. 81, Sept. 1949, p. 152-154.

The need of an acceptable phrase to describe ore-dressing or beneficiation. Data needed before planning control operations.

1A-55. Heavy-Media Separation. Walter P. Gillingham. *Compressed Air Magazine,* v. 54, Oct. 1949, p. 244-249.

New mineral concentrating process for use on a variety of materials including low grade coal and ore deposits.

1A-56. A Study of Present-Day Grinding. L. E. Djingheuzian. *Canadian*

Mining and Metallurgical Bulletin, v. 42, Oct. 1949 (*Transactions of the Canadian Institute of Mining and Metallurgy*, v. 52), p. 555-569; discussion, p. 569.

Critical analysis and correlation of work on the fundamental principles of grinding, i.e., ball milling or similar procedures for reducing the particle size of ores and other lump-form solids. 60 ref.

1A-57. Discussion. B. Minerals Beneficiation. *Mining Engineering* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 184), p. 404-406

Deals with three recent AIME papers.

1A-58. New Processes for the Utilization of Low Grade Ores. R. W. Diamond, C. O. Swanson, and B. P. Sutherland. *Canadian Chemistry and Process Industries*, v. 33, Oct. 1949, p. 887-890, 892-893.

New advances in the processing of simple and complex low-grade ores.

1A-59. Massnahmen zur Verscheissminderung in sieblosen Kugelmühlen. (Methods for Decreasing Wear in Sieveless Ball Mills.) Hans-Joachim Salau. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 1, May 1948, p. 50-52.

Plant experiments showed that by substituting every other steel lining member with beechwood members, wear of the linings is decreased and life is greatly prolonged.

1A-60. (Book) **Minerals and Mineral Deposits.** W. R. Jones and David Williams. 248 pages. 1948. Oxford University Press, London, England. 5s., net.

Three introductory chapters deal with generalities, minerals in world history before the industrial age, and the composition of the earth's crust. Three chapters are devoted to mineralogical science. Next chapters are on minerals and rocks; economic mineral deposits; distribution and production of some of the chief metalliferous mineral deposits; the search for mineral deposits; and the extraction of minerals and metals. Final chapters are on minerals in the industrial age and some international aspects of mineral resources.

1A-61. Floatability of Minerals. F. T. C. Doughty. *Mining Magazine*, v. 81, Nov. 1949, p. 268-271.

General mineral characteristics of common metallic and nonmetallic minerals.

1A-62. Impressions Gained During a Recent Metallurgical Tour of the North American Continent. O. A. E. Jackson. *Journal of the Chemical, Metallurgical & Mining Society of South Africa*, v. 50, Aug. 1949, p. 21-33; discussion, p. 33-40.

Procedures and equipment of some two dozen ore mining and beneficiation plants in the U. S., Canada, and Mexico; compares practice with that of the Witwatersrand in South Africa.

1A-63. Die Aufbereitung der Rammelsberger Erze. (Beneficiation of Rammelsberger Ore.) E. Kraume. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, Sept. 1949, p. 257-263; Oct. 1949, p. 303-309.

Triple-step flotation process which separates the finely ground ore into Pb, Zn, and Fe concentrates. Problems still awaiting solution.

1A-64. Schwimm- und Sinkaufbereitung für Erze. (Float-Sink Beneficiation of Ores.) Herbert Sommerlatte. *Zeitschrift für Erzebergbau und Metallhüttenwesen*, v. 2, Sept. 1949, p. 268-274; Oct. 1949, p. 296-299.

Equipment and procedure. Operating data and prospects for future development.

1A-65. A New Theory of the Ball Mill and Some of Its Applications. (In Russian.) N. P. Neronov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), July 1949, p. 1067-1084.

Basic equations of a new theory of ball milling. These equations are interpreted graphically, permitting rapid determination of optimum conditions of operation.

1B—Ferrous

1B-1. Southern California Iron Mine in Production. *Western Machinery and Steel World*, v. 39, Dec. 1948, p. 99-100.

Development of Eagle Mountain iron ore for use by Kaiser's Fontana plant.

1B-2. Hills of Hematite. Ralph Vaill. *Iron Age*, v. 162, Dec. 16, 1948, p. 80-85.

The first of three articles on the iron ore of Minas Gerais, Brazil, submits a possible answer to the iron-ore dilemma. Located only 12 hr. from the ocean, the ore of Minas Gerais is of a composition and quality unexcelled in the world, all of it higher grade than the ore of the U.S.

1B-3. South Africa Seen as Best Source for Strategic Manganese Ores. Steve Smoke. *Iron Age*, v. 162, Dec. 16, 1948, p. 133-134.

Resources and facilities for their utilization. Brazilian resources.

1B-4. The Mesabi Taconite Problem. H. U. Ross. *Canadian Mining Journal,* v. 69, Dec. 1948, p. 57-61.

Mining and concentration problems.

1B-5. Hills of Hematite. Ralph Vaill. *Iron Age,* v. 162, Dec. 23, 1948, p. 64-68; Dec. 30, 1948, p. 34-40.

The second article on the iron ores of Minas Gerais, Brazil. Time does not permit the retreat of the U. S. steel industry to the seaboard. Problems that must be surmounted to reach the Brazilian ore, largely political. Predicts that no source of iron ore for the U. S. will ever be as cheap as the Mesabi ores, because of shipping costs. High quality may be the controlling factor, as indicated by experience of a Brazilian mill in making cold-rolled strip of superior quality from this ore.

1B-6. U. S. Steel Has Proven Huge Iron Ore Deposit in Venezuela. Tom Campbell. *Iron Age,* v. 162, Dec. 30, 1948, p. 71-72.

New reserves of several hundred million tons of hematite of 62-69% Fe content. Problems involved in exploitation. New Canadian reserves.

1B-7. The Iron Ore Shortage. Real or Fancied? Dan Reebel. *Steel,* v. 124, Jan. 3, 1949, p. 135-137.

An analysis of the factors involved indicates that steelmakers will not be wanting for good-quality ore at any time in the foreseeable future.

1B-8. Preparation of Mesabi Ore for a 2000-Ton Per Day Blast Furnace. S. Naismith. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1476-1479.

Results of a test program in which beneficiated and run-of-mine ores were charged to identical blast furnaces. Economic feasibility of general application of structure beneficiation of the ores.

1B-9. Iron Ore. W. A. Lloyd. *Iron Age,* v. 163, Jan. 6, 1949, p. 228-234, 237-239.

Future possibilities as to replacement of the fast-disappearing Mesabi ores.

1B-10. Raw Materials Problems in Birmingham. R. E. Garrett. *American Iron and Steel Institute,* 1948, 9 pages.

Properties of the ores, the limestone and dolomites, and the coals available.

1B-11. Raw Materials Problems of the Intermountain and West Coast Areas. Walther Mathesius. *American Iron and Steel Institute,* 1948, 14 pages.

Raw materials problems as applied to the iron and steel industry. Available resources of these regions.

1B-12. Investigation of Iron Ore Reserves of Iron County, Utah. Paul T. Allsman. *Skillings' Mining Review,* v. 37, Jan. 15, 1949, p. 1-2. Reprinted from *Bureau of Mines,* Report of Investigations 4388.

1B-13—(Book). **Iron Ore Resources of California.** Olaf P. Jenkins, editor. 304 pages plus 25 inserts. California Division of Mines, Ferry Bldg., San Francisco, Calif.

Thirteen separate papers describing iron ore occurrences in as many different areas in California. Additional papers contain a summary of the iron ore situation in the state and a summary of the investigations of the deposits.

1B-14. Coal and Ore Preparation for 2000-Ton Blast Furnace. Coal. E. J. Gardner. **Ore.** S. Naismith. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 123-125.

Methods used by Inland Steel Co.

1B-15. Iron Ore Review—1948. M. D. Harbaugh. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 57-62.

Production and shipment data; new developments in beneficiation and reserves.

1B-16. Investigation of the Sheep Creek Iron Deposits, Meagher County, Mont. Glenn C. Reed. *U. S. Bureau of Mines,* Report of Investigations 4400, Jan. 1949, 9 pages.

Results of beneficiation tests on a composite sample which included log washing, sink-float, jigging, and tabling. Hydrogen reduction tests followed by Davis-tube wet magnetic analyses also were made.

1B-17. B. C. Steel. F. H. Fullerton. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 25, 30.

Iron-ore deposits in British Columbia.

1B-18. The Steel Industry in Transition. *Metal Progress.* E. E. Thum. v. 55, Feb. 1949, p. 155-157.

The rapidly approaching exhaustion of open-pit mines on the Mesabi range leads to a consideration of future sources of iron ore. A period of rapid development of ore concentrators predicted, even though this may be a temporary expedient while the steel industry is relocated so as to use, economically, new sources of ore.

1B-19. Iron Ore. M. D. Harbaugh. *Mining Congress Journal,* v. 35, Feb. 1949, p. 76-80.

See item 1B-15, 1949.

1B-20. Republic Steel Buys Into Liberia Mining Co. on Iron Ore Deal.

Bill Lloyd. *Iron Age,* v. 163, Mar. 17, 1949, p. 141.

High-grade African deposit and financial and transportation arrangements for its utilization.

1B-21. Anreicherung von Minette. (Concentration of Minette Ore.) Walter Luyken. *Stahl und Eisen,* v. 68, Jan. 29, 1948, p. 35-38.

Earlier methods and results. A process in which iron ore containing about 25% Fe is subjected to a magnetizing roasting process, followed by magnetic precipitation. Micrographs show the mineral constitution of the samples.

1B-22. Investigation of Cheever Limonite Deposit, Berkshire County, Mass. R. J. Burgess and Robert S. Sanford. *U. S. Bureau of Mines,* Report of Investigations 4423, Mar. 1949, 13 pages.

Beneficiation tests conducted on three samples of churn-drill sludge that contained 31.2, 28.1, and 22.2% iron, respectively. Sink-and-float separation and flotation recoveries were not encouraging. Best results were obtained after roasting followed by attrition grinding and wet magnetic separation.

1B-23. Charleson Lean-Ore Plant to Treat Old Stockpile. R. W. Keehn. *Engineering and Mining Journal,* v. 150, Apr. 1949, p. 80-81.

Flowsheet of new jig plant of Charleson Mining Co. for beneficiating iron ore in the Missabe Mountain-Minnewas lean-ore stockpile on the Mesabi Range.

1B-24. Canada's Future Brightens as Producer of Iron Ore. John B. DeMille. *Engineering and Mining Journal,* v. 150, Apr. 1949, p. 90-91.

Known and possible future reserves in various Canadian locations.

1B-25. Fused Ore for the Openhearth. E. S. Kopecki. *Iron Age,* v. 163, Apr. 7, 1949, p. 82-86.

Continuous-fusion operation, using iron-bearing materials of any degree of fineness as raw material, for production of charge and feed ore of sizes and densities best suited for the openhearth process. Pilot-plant experiments conducted successfully on more than 1000 tons of various grades of iron-bearing materials indicate efficiency of the process, at conversion costs approximating downdraft sintering processes.

1B-26. Effect of Sized and Sintered Mesabi Iron Ores on Blast-Furnace Performance. H. F. Dobscha. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 49-57; discussion, p. 57-67.

Economical and productive gains derived at blast furnaces from size preparation of Mesabi ores are substantial. It is apparent that blowing equipment of sufficient capacity will be necessary to realize full benefits from beneficiated burdens. Consideration of hydraulic or other improved methods of screening is recommended since poor furnace operation occurred when the plus 20-mesh material in the agglomerates was substantially under 90%.

1B-27. Proposed Flowsheet for Taconite Concentration at Babbitt. H. K. Martin. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 68-72; discussion, p. 72-82.

Proposed flowsheet based on experimental work at Mines Experiment Station in Minneapolis for a taconite deposit averaging 24% Fe in the form of magnetite.

1B-28. Features of the Sintering Plant at Wisconsin Steel Works. Paul R. Nichols. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 83-86.

Illustrative of practice at a sintering plant of earlier design.

1B-29. Operations and Practice, Campbell Sintering Plant. D. P. Cromwell. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 86-88; discussion, p. 89.

Equipment and procedures.

1B-30. Sintering Plant and Practice at Steubenville. Guy Wehr. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 89-94.

Equipment, layout, and procedures.

1B-31. Sintering Practice at Fontana, California. J. D. Saussaman. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 95-106.

Plant and its equipment. Data on performance, and crushing and grinding flowsheet.

1B-32. Operating Features and Practices at the Bethlehem Sintering Plant. A. H. Fosdick. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 106-118; discussion, p. 118.

1B-33. Operating Features at the Zug Island Sintering Plant. Charles P. Betz. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 118-122; discussion, p. 122-126.

Discussion includes "Summary of Achievements", by M. F. Morgan; "Factors Governing Design of Sintering Plants", by E. W. Shallock; "Sintering Plant on a Small Site", by T. W. Plante; and "Sintering Practice of Inland Steel", by C. B. Sheets.

1B-34. Brazil's First Sintering Plant Now in Operation at Monlevade, Minas Gerais. *Blast Furnace and Steel Plant,* v. 37, Apr. 1949, p. 445-446.

1B-35. Iron Ore Sintering. H. U. Ross. *Canadian Mining Journal,* v. 70, Apr. 1949, p. 79-84.

Principles of process used to agglomerate fine iron lost from the blast furnace so it can be recharged. The various types of sintering equipment in commercial use.

1B-36. Iron Ore Beneficiation. Francis X. Tartaron. *Mining Engineering,* v. 1, sec. 1, May 1949, p. 14-18.

Various processes and the future of beneficiation.

1B-37. Iron Ore Blending Operations of Geneva Steel Company in Utah. C. L. Waggoner. *Skillings' Mining Review,* v. 38, May 14, 1949, p. 1, 4. A condensation.

1B-38. Agglomeration of Taconite Concentrate. Worm Lund. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 1-3.

Filter briquetting process employed in Norway before the war, this process having superseded the earlier sintering plant. Early tests with a pelletizing process.

1B-39. Iron Ore Concentration at Sydvaranger, Norway. J. Kraft Johanssen. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 4-11.

Dressing, crushing, and concentrating magnetite iron ore mined at Aktieselskabet Sydvaranger, and composition of the ore. The method of concentrating by magnetic separation and degree to which the concentrate is dewatered. The old plant was destroyed during the war. Proposals for the new plant.

1B-40. Die Aufbereitung als Grundlage fur die Verhuttung armer saurer Erze. (Beneficiation as a Preliminary to Smelting Low-Grade Acid Ores.) Carl Paul Debuch. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 205-212.

The supply and mining of ores in the Salzgitter area and the methods and equipment used in their beneficiation.

1B-41. Eagle Mountain Iron Ore Reserves Expected to Meet Fontana's Requirements for 40 Years. *Steel,* v. 124, May 30, 1949, p. 60-61.

Reserves which supply Kaiser Co., Fontana, Calif.

1B-42. Iron Ore Conditioning and Sintering. Francis H. Crockard. *Iron and Steel Engineer,* v. 26, May 1949, p. 106, 108. A condensation.

1B-43. Iron Resources of Wisconsin. E. F. Bean. *Skillings' Mining Review,* v. 38, June 4, 1949, p. 1, 4, 11.

1B-44. Average Analyses of 1948 Shipments of Lake Superior Iron Ore. *Skillings' Mining Review,* v. 38, June 11, 1949, p. 1-2.

For the various ranges.

1B-45. Sintering to Raise Iron Ore Output. *Engineering and Mining Journal,* v. 150, June 1949, p. 59.

Methods now in use at plant of Siderurgica Belgo-Mineira, Brazil.

1B-46. Britain Gets Half Its Iron From Its Lean Ores. David D. Howat. *Engineering and Mining Journal,* v. 150, June 1949, p. 66-69.

Lean-ore smelting practice and preparation in Britain. Crushing, screening, drying, agglomeration, and charging practice have been developed so that the industry can utilize ores containing only 18-25% Fe economically.

1B-47. Sintering Characteristics of Minus Sixty-Five and Twenty Mesh Magnetite. Alan Stanley and Joseph C. Mead. *Mining Engineering,* v. 1, sec. 3, June 1949 (*Mining Transactions,* v. 184), p. 181-186.

Work done to improve the quality of the ilmenite concentrate produced from a titaniferous iron ore, and to reduce the amount of TiO_2 lost in tailings and magnetite product. The crude ore is ground to —65 mesh, and concentrated by magnetic separation of magnetite and flotation of ilmenite. Details of work using a Greenawalt pilot sintering plant. Factors investigated were: return fines, coal, moisture, slaked

lime and miscellaneous reagents, oxidation, limestone, sawdust, pellets, "dust", and mixing time. Production runs were made.

1B-48. Humphreys Spiral Concentration on Mesabi Range Ores. Whitman E. Brown and Louis J. Erck. *Mining Engineering,* v. 1, sec. 3, June 1949 (*Mining Transactions,* v. 184), p. 187-193.

Installation of Cleveland - Cliffs Iron Co. at its Hill-Trumbull plant on the Mesabi Range. Flow diagrams and operating data.

1B-49. Nove myslenky o nejstarsim pravekem vyskytu zeleza a zelezarstvi ve stredni Evrope. (New Data Concerning Deposits of Iron Ore in Central Europe.) Josef Skutil. *Hutnicke Listy,* v. 3, Dec. 1948, p. 366-370.

1B-50. Investigation of the Waukon Iron Deposit, Allamakee County, Iowa. Paul E. Pesonen. *U. S. Bureau of Mines,* Report of Investigations 4479, June 1949, 22 pages.

Average grade of ore was indicated to be 37.02% Fe and 27.78% SiO_2 on a dry basis. Beneficiation tests indicated that the percentage of recovery might be relatively low. Results of gravity-concentration and magnetic concentration tests.

1B-51. Iron Ore Beneficiation. Francis X. Tartaron. *Journal of Metals,* v. 1, sec. 1, July 1949, p. 10-14.

Previously abstracted from *Mining Engineering.* See item 1B-36, 1949.

1B-52. Sintering Characteristics of Minus Sixty-Five and Twenty Mesh Magnetite. Alan Stanley and Joseph C. Mead. *Journal of Metals,* v. 1, sec. 3, July 1949, (*Metals Transactions,* v. 185), p. 435-440.

Previously abstracted from *Mining Engineering.* See item 1B-47, 1949.

1B-53. The Preparation of Iron Ore for Blast Furnace and Open Hearth Use. Robert R. Williams, Jr. "Yearbook of the American Iron and Steel Institute, 1948", p. 368-386; discussion. p. 387-390.

Previously abstracted from *American Iron and Steel Institute,* preprint, item 1B-14, 1948.

1B-54. European Experience in Rotary Kiln Nodulizing of Iron Fines and Flue Dust. H. Berg. *Blast Furnace and Steel Plant,* v. 37, July, 1949, p. 799-801.

1B-55. The Problem of Iron Ore and How It Will Be Solved. A. H. Hubbell. *Engineering and Mining Journal,* v. 150, July 1949, p. 84-91.

Extensive survey consists of separate sections on beneficiation of Mesabi taconite; and ore reserves in Labrador, Venezuela, and Liberia.

1B-56. Rotary-Kiln Nodulizing Is Simple, Costs Less. H. Berg. *Engineering and Mining Journal,* v. 150, Aug. 1949, p. 56-58.

Experience with iron-ore fines and blast-furnace flue dust at European plant is cited to show advantages of nodulizing in a rotary kiln.

1B-57. Quebec-Labrador as a Future Supply of Iron Ore for the United States. Norwood B. Melcher. *Skillings' Mining Review,* v. 38, Aug. 6, 1949, p. 1, 4, 6-7. Reprinted from *Mineral Trade Notes,* Special Supplement No. 29 to v. 27, Oct. 1948.

1B-58. Mining and Treating of Banded Taconite at Mary Ellen Mine. *Skillings' Mining Review,* v. 38, Sept. 24, 1949, p. 1, 4.

Pit equipment and layout, crushing plant, and heavy media plant for treating low grade ores in Minnesota.

1B-59. Iron Ore Preparation Plant. A. W. Leadbeater and Oliver Thomas. *Mechanical Handling,* v. 36, Sept. 1949, p. 519-529.

British plant.

1B-60. Beneficiation of Iron Ore. Grover J. Holt. *Blast Furnace and Steel Plant,* v. 37, Sept. 1949, p. 1061-1066.

Reviews the present iron ore reserve picture. Low-grade ore reserves and beneficiation procedures.

1B-61. HMS Taconite Treatment. *Mining World,* v. 11, Oct. 1949, p. 22-25.

Successful beneficiation procedure at the Mary Ellen Mine of the Stanley Mining Co., Minn., for recovering taconite.

1B-62. A Look at the Iron Ore Situation. T. L. Joseph and E. P. Pfleider. *Blast Furnace and Steel Plant,* v. 37, Oct. 1949, p. 1195-1198.

Extensive analysis of the various factors involved. Graphs and tables show past performance and projected trends.

1B-63. Erie Mining Co. Continues Taconite Research on Mesabi Iron Range. *Skillings' Mining Review,* v. 38, Oct. 22, 1949, p. 1-2.

The preliminary concentration plant, flow diagrams.

1B-64. Heavy Media Concentrator at Grant Iron Mine—Mesabi Range. A. N. Wold. *Skillings' Mining Review,* v. 38, Oct. 29, 1949, p. 1, 4.

1B-65. Die Grundlagen der wirtschaftlichen Verarbeitung von Rotschlamm. (The Principles of the Economical

Processing of Red Mud.) (Concluded.) Friedrich Vogel. *Metall,* v. 3, Aug. 1949, p. 260-262.

A chemical method of converting the iron oxide in red mud into FeS which then is reduced to iron by electrolysis. TiO_2 is obtained as a by-product. 17 ref.

1B-66. Taconite Beneficiation Plants. *Iron and Steel Engineer,* v. 26, Nov. 1949, p. 109-110.

Proposed plants of Erie Mining Co. to be located on the Mesabi range.

1B-67. Iron Ore: Its Mining, Beneficiation and Reserves. Parts I-III. E. W. Davis. *Steel,* v. 125, Nov. 21, 1949, p. 96, 99, 102, 105, 108, 111-112; Nov. 28, 1949, p. 78, 81-82, 84, 92; Dec. 5, 1949, p. 122, 124, 127-128.

Part I: Mining, both open pit and underground. Taconite rock as a substitute for the gradually declining Mesabi ore. Other domestic sources. Part II: Beneficiation processes in commercial use, and extent to which they are applied to various U. S. iron ores. Part III: Future prospects.

1B-68. Investigation of the Dayton Iron Deposit: Lyon and Storey Counties, Nev. Robert W. Geehan. *U. S. Bureau of Mines,* Report of Investigations 4561, Nov. 1949, 34 pages.

Includes some data on beneficiation.

1B-69. Iron Ore Concentration in Sweden. H. U. Ross. *Skillings' Mining Review,* v. 38, Dec. 10, 1949, p. 1, 4, 13.

Unusual features as compared with U. S. practice.

1B-70. Handling Mesabi's Taconite. *Mining World,* v. 11, Dec. 1949, p. 20-21.

Work of Erie Mining Co. and flow sheet of beneficiation plant. Photomicrographs show structures of various taconites.

1B-71. Future of Iron Resources. Donald B. Gillies. *Mining Engineering* (Features Section), v. 1, Dec. 1949, p. 34-38.

New methods of utilization and conservation of Lake Superior reserves and work being done in Labrador, Newfoundland, Liberia, and in the Adirondacks.

1B-72. Beneficiation of Northern Iron Ores. Francis X. Tartaron. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 113-118.

See abstract from *Mining Engineering,* item 1B-36, 1949.

1C—Nonferrous

1C-1. High Recovery Made on Unclassified Coarse Product Using Center or Side Draw-Off on Denver Selective Mineral Jig. Robert E. Lintner. *Deco Trefoil,* v. 12, Nov.-Dec. 1948, p. 4.

Operation in which a 6% lead unclassified —¾-in. feed produces a total Pb recovery of 96.9%.

1C-2. Custom Milling: American Zinc, Lead and Smelting Company, Ouray, Colorado. D. C. McLean, Hildreth Frost, Jr., and M. L. Kay. *Deco Trefoil,* v. 12, Nov.-Dec. 1948, p. 5-12.

Equipment and procedures; flow diagram.

1C-3. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXVII. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 24, Dec. 1948, p. 831-838.

Deals with tungsten and its compounds. (To be continued.)

1C-4. Recent Improvements in Milling Practice at Wright-Hargreaves. Malcolm Black. *Canadian Mining and Metallurgical Bulletin,* v. 41, Dec. 1948, p. 667-673. (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 51, p. 286-292.)

Changes in equipment and procedures for thickening, flotation, control of mill froth, and clarification at gold-refining mill.

1C-5. Concentrating, Smelting and Research at the Flin Flon Mine. Geo. E. Cole. *Western Miner,* v. 22, Jan. 1949, p. 48-52.

Crushing and grinding, copper concentration, zinc concentration, cyanidation for recovery of gold, zinc casting, zinc electrodeposition, and copper smelting. The research department and its activities.

1C-6. How Much Uranium Have We? *Metal Progress,* v. 55, Jan. 1949, p. 47.

Discusses contradictory statements on the above subject by various responsible men.

1C-7. Changes in the Wettability of Metals and Sulfide Minerals Under the Action of Different Gases. (In Russian.) I. N. Plaksin and S. V. Bessonov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 11, 1948, p. 865-868.

The above were investigated for gold, silver, copper, and their sulfides. Methods of investigation. Data indicate the selective action of oxygen on the mineral surfaces.

1C-8. Geology and Reserves of Lead and Zinc Ores: A World Survey. K. C. Dunham. *Nature,* v. 163, Jan. 1, 1949, p. 9-11.

Proceedings of Section F of the 18th session of the International Geological Congress, London (sum-

mer 1948). 35 papers on the above subject were presented.

1C-9. Uranium Deposits in the USSR. D. B. Shimkin. *Science*, v. 109, Jan. 21, 1949, p. 58-60.

Reviews available literature (mostly Russian) on the above. 28 ref.

1C-10. The Flotation of Copper Silicate From Silica. R. W. Ludt and C. C. DeWitt. *Mining Engineering* (Transactions Section), v. 1, Feb. 1949, p. 49-51.

An experimental study using synthetic mixtures. Alkali-substituted malachite-green dyes act as collectors for chrysocolla in synthetic silica-chrysocolla mixtures. Effects of amount of collector, method of addition, and presence of colloidal material. 14 ref.

1C-11. Flake-Graphite and Vanadium Investigation in Clay, Coosa, and Chilton Counties, Ala. Hugh D. Pallister and J. R. Thoenen. *Bureau of Mines.* Report of Investigations 4366, Dec. 1948, 84 pages.

Sampling data, and mining and milling methods. 53 ref.

1C-12. Mining and Milling Antimony Ore at Consolidated Murchison Goldfields, Transvaal. Ralph Symons. *Bulletin of the Institution of Mining and Metallurgy*, Jan. 1949, p. 1-36.

Topography, history, geology, prospecting, mining, surveying and sampling, assaying, surface transport, the ore-reduction process, power generation and distribution, compressed-air and water supply, labor, medical and social services, and costs. Crushing and sorting, milling, gold concentration, roasting of gold concentrate, treatment of calcine, antimony recovery, cyanidation of flotation tailings, and gold amalgamation and precipitation.

1C-13. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXVIII. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer*, v. 25, Jan. 1949, p. 9-16.

Uranium and radium, their ores, concentration methods, and uses. (To be continued.)

1C-14. (Book). **Strategic and Critical Minerals and Metals. Part 1. Manganese. Part 2. Chromite. Part 3. Copper. Part 4. Preliminary Review of the Problems of the Tungsten and Mercury Mining Industries. Part 5. Stockpiling.** 1541 pages and 22 charts. 1948. U. S. Government Printing Office. (Committee Hearing No. 38.)

Complete report of hearings before the Subcommittee on Mines and Mining of the Committee on Public Lands, House of Representatives, 80th U. S. Congress, 2nd Session. Consists of 4 volumes (Parts 4 and 5 combined).

1C-15. Investigation of Valzinco Lead-Zinc Mine, Spotsylvania County, Va. Wesley A. Grosh. *U. S. Bureau of Mines*, Report of Investigations 4403, Jan. 1949, 7 pages.

Milling and concentration flowsheet.

1C-16. Application of Ion Exchange Resins in the Cyanidation of a Gold and Silver Ore. S. J. Hussey. *U. S. Bureau of Mines*, Report of Investigations 4374, May 11, 1948, 34 pages.

Recovery of Au and Ag from a clayey, slimy ore.

1C-17. Concentration of Oxide Manganese Ores From Northeastern Utah, Daggett Chief and Gray Hawk Properties. R. Havens and J. A. McAllister. *U. S. Bureau of Mines*, Report of Investigations 4389, Jan. 1949, 14 pages.

Investigations on two manganese deposits for domestic use. Results for three different ores.

1C-18. Investigation of the Electric Point and Gladstone Lead-Zinc Mines, Stevens County, Wash. John W. Cole. *U. S. Bureau of Mines*, Report of Investigations 4392, Jan. 1949, 11 pages.

Includes results of mineral dressing tests.

1C-19. Sampling of Helen Beryl Pegmatite, Custer County, S. Dak. John Paul Gries. *U. S. Bureau of Mines*, Report of Investigations 4396, Jan. 1949, 14 pages.

Includes results of beneficiation tests.

1C-20. Copper Industry. J. G. Leckie. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology*, v. 1, sec. 2, Mar. 1949, p. 76-77.

New production and technological developments.

1C-21. The Recovery of Cadmium From Cadmium-Copper Precipitate, Electrolytic Zinc Co. of Australasia, Risdon, Tasmania. G. H. Anderson. *Journal of Metals*, v. 1, sec. 3, Mar. 1949, p. 205-210.

Oxidation and grinding of the Cd-Cu precipitate; leaching and filtering; precipitation of Cd; oxidation and grinding of the precipitated Cd; leaching oxidized Cd precipitate and purification of leach solution; electrolysis; and melting, casting, and packing. Includes flow diagrams.

1C-22. Atomic Energy Minerals. *Min-*

ing Congress Journal, v. 35, Feb. 1949, p. 48-52.

Recent developments and trends.

1C-23. Mineral Dressing in 1948. A. W. Schlechten and T. M. Morris. *Mining Congress Journal,* v. 35, Feb. 1949, p. 81-83.

New developments.

1C-24. A Rapid Determination for Calcium. J. E. Williamson. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 75.

Technique used in control of alkalinity of cyanidation solutions.

1C-25. Minerals for Chemical and Allied Industries. A Review of Sources, Uses and Specifications. Part XXIX. J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 25, Feb. 1949, p. 117-123.

Vanadium and compounds. (To be continued.)

1C-26. Investigation of Big Ben Molybdenum Deposit, Neihart District. Cascade County, Mont. J. A. Herdlick. *U. S. Bureau of Mines,* Report of Investigations No. 4406, Feb. 1949, 22 pages.

History, location, description of deposit, sampling, and analyses. Results of routine metallurgical testing. Approximately 88.9% molybdenite was obtained with 77% recovery.

1C-27. The Occurrence of Chromium in Ilmenite From Nories Head, N.S.W., and Stradbroke Island, Queensland. *Joint Investigations of the Council for Scientific and Industrial Research and the University of Melbourne,* Investigation No. 337, May 25, 1948, 6 pages.

Results of mineralogical examination and magnetic separation of above two samples. Results are believed promising.

1C-28. Treatment of Ore From Black Jack Gold Mining Co., N. L., Near Charters Towers, Queensland. *Joint Investigations of the Council for Scientific and Industrial Research and the University of Melbourne,* Investigation No. 334, June 9, 1948, 4 pages.

Results of tabling and cyanidation tests; recommendations.

1C-29. Concentration of Lead-Zinc Silver Ore From Isobella Mine, Herberton, Q'Ld. *Joint Investigations of the Council for Scientific and Industrial Research and the University of Melbourne,* Investigation No. 333, July 7, 1948, 10 pages.

Results of sampling and beneficiation tests. Mineralogical examination, jigging, table concentration, flotation, and comparison of alternative treatment schemes. Only the zinc is believed capable of economic recovery.

1C-30. Concentration of Lead Ore From Leadville, N.S.W. *Joint Investigations of the Council for Scientific and Industrial Research and the University of Melbourne,* Investigation No. 341, July 16, 1948, 6 pages.

Results of table-concentration and flotation tests on oxidized lead ore. Effects of different crushing methods were determined.

1C-31. Gegenwärtiger Stand der Gewinnung von Indium aus Rammelsberger Erz. (Present Status of the Extraction of Indium From Rammelsberger Ore.) Reinhard Kleinert. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Jan. 1949, p. 14-18.

A brief historical review and the steps of enriching the In-bearing ore and of extracting and refining this metal.

1C-32. Minerals for Chemical and Allied Industries; A Review of Sources, Uses and Specifications. Part XXX. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer,* v. 25, Mar. 1949, p. 187-195.

Deals with zinc and zinc compounds. Ore deposits, beneficiation, smelting and refining, specifications, alloys, and uses; as well as pigments, paints, and Zn salts. Production statistics. (To be continued.)

1C-33. Investigation of Claim Point Chromite Deposits, Kenai Peninsula, Alaska. R. S. Sanford and J. W. Cole. *U. S. Bureau of Mines,* Report of Investigations 4419, Mar. 1949, 11 pages.

Section on beneficiation; nature of the ore and methods of concentration.

1C-34. Source Materials for Nuclear Power. Roland D. Parks. **"The Science and Engineering of Nuclear Power." Vol. II.** Addison-Wesley Press, Cambridge, Mass., 1949, p. 1-18.

Location of various deposits of uranium and thorium in the U. S. and abroad. Sources of other materials required for production of nuclear energy (B, Be, Bi, Pb, He, Cd, Hg, Na, K, and graphite).

1C-35. Milling Practice on the Golden Mile. S. G. Salamy. *Mine & Quarry Engineering,* v. 15, Apr. 1949, p. 101-106.

Metallurgical practice at an important Australian gold field. Description of mineralogy and mining practices. Flowsheets illustrate methods of treating the various ores. Possible alternative processes.

1C-36. Fluo-Solids Roasting of Arsenopyrite Concentrates at Cochenour Willans. Owen Matthews. *Canadian Mining and Metallurgical Bulletin*, v. 42 (*Transactions of the Canadian Institute of Mining and Metallurgy*, v. 52), Apr. 1949, p. 178-187.

Use of new "fluidized" technique for roasting. The reactor has demonstrated its ability to roast a flotation concentrate containing arsenopyrite, pyrite, stibnite, small quantities of other sulfides, and some lime silicates and carbonates, yielding a calcine consisting mainly of porous iron oxide, plus gold values. This calcine is readily amenable to cyanidation.

1C-37. Effects of Rod Mill Speed at Tennessee Copper Company. J. F. Myers and F. M. Lewis. *Mining Engineering*, v. 1, sec. 3, May 1949 (*Mining Transactions*, v. 184), p. 131-132.

Relative power efficiency of fast and slow rod-mill speeds on ores. Tests were made under normal operating conditions.

1C-38. Minerals for Chemical and Allied Industries. Part XXXI. Sydney J. Johnstone. *Industrial Chemist and Chemical Manufacturer*, v. 25, Apr. 1949, p. 243-247.

Concluding article of series deals with zirconium and its compounds—their sources, methods of recovery, uses, and specifications. Ceramic, refractory, and metallurgical uses.

1C-39 (Book). **Handbook of Uranium Minerals: A Guide for the Prospector and Miner. Ed. 2.** Jack De Ment and H. C. Dake. 96 pages. 1948. Mineralogist Publishing Co., 329 Southeast 32nd Ave., Portland 15, Ore.

A descriptive catalog of the uranium and thorium minerals, including their occurrence, detection, location, and exploration.

1C-40. Akron Unit Mills Complex Ore. K. K. Hood. *Mining Congress Journal*, v. 35, May 1949, p. 41-43.

Deposits and methods of treatment. Ore varies widely in grade and physical qualities.

1C-41. Trennung von Grobkorn in Schwertrube bei der Aufbereitung von Ramsbecker Bleizinkerz. (The Separation of Coarse Grains in Heavy Sludge in the Dressing of Ramsbecker Lead-Tin Ore.) Gunther Salzmann. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 1, June 1948, p. 72-79.

Experiments were made to find ways of replacing handpicking of ores by a heavy-media separation method.

1C-42. Uber die Möglichkeit der Ausbringenssteigerung einer Erzaufbereitung durch Verlagerung der Vermahlung ins Gröbere. (The Possibility of Increasing the Yield of an Ore Dressing Plant by Changing to a Coarser Grind.) F. Zrenner. *Archiv fur Metallkunde*, v. 2, Oct. 23, 1948, p. 163-170.

The system, yield, and consumption of reagents of an existing copper flotation plant (daily output: 2250 tons). How improved yields and concentrate qualities were achieved.

1C-43. Investigation of Concentration Sections at the Central Mill of the Eagle-Picher Mining & Smelting Co., Cardin, Okla. H. Kenworthy, W. A. Calhoun, and M. M. Fine. *U. S. Bureau of Mines*, Report of Investigations 4511, May 1949, 37 pages.

Sink-float, ferrosilicon, flotation-tailing, and jetting investigations.

1C-44. Uranium Resources. *Nucleonics*, v. 4, May 1949, p. 23-28. Based on address by J. K. Gustafson.

Occurrence in nature, supply, and U. S. uranium program.

1C-45. The Vanadium-Bearing Solid Bitumens of the Argentine. F. F. Kett. *Vancoram Review*, v. 6, no. 1, (1948), p. 3-6, 18-21.

Investigation made by the Vanadium Corp. of America in Argentina gives location, extent, and analyses of deposits.

1C-46. (Book) **Tungsten Mineralization in the United States.** Paul F. Kerr. 241 pages. 1946. Geological Society of America, 419 West 117th St., New York, N. Y.

Occurrences from the standpoint of origin. Localities on record prior to January 1942 and more important discoveries reported since. 15-page bibliography.

1C-47. Investigation of Coyote Creek Antimony Deposits, Garfield County, Utah. W. M. Traver. *U. S. Bureau of Mines*, Report of Investigations 4470, June 1949, 18 pages.

Ore-dressing tests on above ore. Sink-and-float testing, and jigging combined with tabling.

1C-48. Investigation of Sublette Ridge Vanadium Deposit, Lincoln County, Wyo. Paul T. Allsman, Forest H. Majors, Stanford R. Mahoney, and W. A. Young. *U. S. Bureau of Mines*, Report of Investigations 4476, June 1949, 8 pages.

Results of flotation tests and of heavy-media separation as applied to minus 2-in. ore.

1C-49. Concentration of Oxide Man-

ganese Ores From Columbia and Elberta Mining Districts, Tooele and Juab Counties, Utah. (Wildcat, Sharp, and Aeronaut No. 1 Properties.) K. C. Dean and K. C. Vincent. *U. S. Bureau of Mines,* Report of Investigations 4466, June 1949, 11 pages.

Occurrence and nature of above ores; results of beneficiation. Amenability to concentration is indicated for the Wildcat and Sharp properties, but not for the Aeronaut No. 1.

1C-50. The Concentration of Beach Sands. Interim Report No. 1. Flotation of Zircon—Preliminary Studies. H. H. Dunkin and K. S. Blaskett. *Metallurgical Laboratory, University of Melbourne,* Joint Investigation No. 303 of the Council for Scientific and Industrial Research and the University of Melbourne, May 4, 1949, 27 pages.

First of a series of general reports. Details of a successful method for obtaining high recoveries of zircon in a high-grade concentrate. The method is shown to be applicable to samples of varying mineral composition drawn from several sources.

1C-51. Metallurgical Investigations of the Recovery of Zinc and Iron Sulfides From the Gray Zinc-Iron Deposit, Galena, Ill. H. Kenworthy. *U. S. Bureau of Mines,* Report of Investigations 4442, June 1949, 12 pages.

Data on table concentration, flotation, crushing and sizing, and sink-float treatment.

1C-52. Colorimetric Determination of Tin in Ores. (In Russian.) V. A. Nazarenko, L. E. Shvartzburd, and I. A. Soiferman. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 387-394.

Use of dithiol. Methods of preventing difficulties due to the presence of Mo, As, Sb, Ge, Te, V, and Cr.

1C-53. Flotation of Gold-Copper Ore From the Laloki Mine, Sapphire Creek, Papua. K. S. Blaskett and H. H. Dunkin. *Council for Scientific and Industrial Research and the University of Melbourne, Metallurgical Laboratory* (Joint Investigations), Ore-Dressing Investigation No. 349, Oct. 21, 1948, 17 pages.

Results of an investigation on the effect of aeration before flotation on recovery of copper. Flotation tests.

1C-54. Electrostatic Separation. Interim Report No. 1; Preliminary Studies. S. B. Hudson. *Commonwealth Scientific and Industrial Research Organization and the University of Melbourne* (Joint Investigations), Ore-Dressing Investigation No. 372, May 24, 1949, 21 pages.

Variation of displacement of the median with voltage. A flotation zircon concentrate was given various treatments, which altered the ranges of reversibilities.

1C-55. Investigation of Tin-Bearing Pegmatites in the Tinton Area, Lawrence County, S. Dak. William F. Jahn and Paul E. Pesonen. *U. S. Bureau of Mines, Report of Investigations* 4484, July 1949, 25 pages.

Description of beneficiation tests.

1C-56. Uranium and Atomic Energy. W. H. Dennis. *Mine & Quarry Engineering,* v. 15, July 1949, p. 211-218.

Various aspects including occurrence, concentration methods (includes flow-sheets), preparation of the metal, principles of atomic energy, methods of separation of isotopes, military and industrial uses, radioactive isotopes, and the "breeding" system.

1C-57. Beating a Lead Oxide Mill Fee. *Mining World,* **v. 11, July 1949, p. 10-13.**

Method to recover lead oxide minerals in a mixed mill feed. Although the method is not entirely satisfactory, tailing losses have been reduced materially. A comparatively simple rearrangement of the recovery elements and the addition of Denver flotation cells resulted in the benefits described.

1C-58. Prospecting for Uranium. 123 pages. 1949. U. S. Atomic Energy Commission and U. S. Geological Survey, Washington.

Uranium-bearing minerals. Types of deposits, tests for U, and prospecting with the Geiger counter. Laboratory assay and selling procedures, and laws and regulations.

1C-59. Semi-Pilot-Plant Tests on Treatment of Manganese-Silver Ores by the Dithionate Process. S. F. Ravitz, A. E. Back, K. E. Tame, W. F. Wyman, and J. L. Dewey. *U. S. Bureau of Mines,* Technical Paper 723, 1949, 45 pages.

The development and operation of a continuous semi-pilot plant for treating ores, and results obtained with specific ores. 20 ref.

1C-60. Sources of Rhenium. J. G. F. Druce. *Industrial Chemist and Chemical Manufacturer,* v. 25, July 1949, p. 348.

Various investigations carried out in the search for compounds of rhenium.

1C-61. High Recovery at the Silver Standard. H. M. Wright. *Western*

Miner, v. 22, Aug. 1949, p. 42-48.

Details of 60-ton-per-day silver-lead-zinc operation with additional values in gold and cadmium, located in north-central British Columbia.

1C-62. The Granby Story: Granby Milling Operations. L. H. McKay. *Western Miner,* v. 22, Aug. 1949, p. 60, 62.

Equipment and procedures of copper concentrators at two locations in Western Canada.

1C-63. Laboratory Ore Testing Procedure. Part III. Clarence Thom. *Deco Trefoil,* v. 13, July-Aug. 1949, p. 7-10.

Machines and procedures used in carrying out a cyanide test in an ore-dressing laboratory.

1C-64. Magma Copper's New Mill. *Mining World,* v. 11, Sept. 1949, p. 16-19.

Mill designed and constructed to provide maximum output for a convertible Cu-Zn flotation circuit. Flow diagrams.

1C-65. Influence de la préparation mécanique sur l'amalgamation de l'or. (Influence of Mechanical Preparation on the Amalgamation of Gold.) Alexandre Prigogine. *Revue de Métallurgie,* v. 46, May 1949, p. 269-276.

Results on four different types of ore from South Africa indicate that method of ore dressing and other related factors, such as degree of grinding and temperature, have a large influence on the percent of gold extraction by amalgamation.

1C-66. Origin of the Natural Hydrophobic Nature of Sulfide Minerals Under Flotation Conditions. (In Russian.) I. N. Plaksin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 91-93.

Experimental investigation indicates that the flotability of sulfide minerals is mostly related to the edge angle of wetting, variation of which is related to the oxygen adsorbability of the mineral and metal surfaces. Influence of time of contact of such surfaces with air and water on the value of the edge angle of wetting is established.

1C-67. Selektive Flotation der Blei-Zink-Kupfererze von Tsumeb durch kombinierte Cyan-Bichromat-Trennung. (Selective Flotation of Tsumeb Lead-Zinc-Copper Ores by the Combined Cyanogen-Dichromate Separation Process.) A. Götte. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 185-187.

Claimed to be a more efficient, economical, and simpler method for these Cu-containing Zn-Pb ores.

1C-68. The Rare Earth Industry. Howard E. Kremers. *Journal of the Electrochemical Society,* v. 96, Sept. 1949, p. 152-157.

Extraction of Ce and other rare earths from monazite sand, and the principal uses. 13 ref.

1C-69. A Reaction Between Solids; The Formation of Zinc Ferrite From Zinc Oxide and Ferric Oxide. D. W. Hopkins. *Journal of the Electrochemical Society,* v. 96, Sept. 1949, p. 195-203.

The above was investigated from 600-1150° C. in an attempt to determine the effect of temperature of preparation of Fe_2O_3 on the rate of compound formation and to examine the mechanism controlling the rate within a given system of reactants. This reaction is of considerable importance in the extraction of Zn by acid leaching of roasted sulfides, since $ZnO \cdot Fe_2O_3$ is insoluble in dilute mineral acids. 13 ref.

1C-70. Investigations on the Production of Electrolytic Cobalt from a Copper-Cobalt Flotation Concentrate. H. L. Talboy and H. N. Hepker. *Bulletin of the Institution of Mining and Metallurgy,* no. 514, Sept. 1949, p. 1-19.

Laboratory and pilot-plant investigations. In one process the concentrate is smelted to matte from which the Co is leached with H_2SO_4 and recovered by electrolysis from the purified solution; in another process the concentrate is roasted and the Co extracted from the calcine by leaching with hot water, after which it is recovered from the purified solution by electrolysis. Processes are particularly applicable for recovery of Co from sulfide concentrates of relatively low Co content and high Fe-Co ratio.

1C-71. Selektive Flotation der Blei-Zink-Kupfer-Erze von Tsumeb. (Selective Flotation of Tsumeb Lead-Zinc-Copper Ores.) August Götte. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 1, Oct. 1948, p. 204-208.

Previously abstracted from *Archiv für Metallkunde* See item 1C-67, 1949.

1C-72. The Ashcroft-Elmore Tin Process. H. L. Malan. *Mining Magazine,* v. 81, Sept. 1949, p. 137-143.

Process for recovering electrolytic tin from low-grade concentrates and complex ores. Includes diagrams of equipment.

1C-73. For Lower-Cost Regrinding. Franklin T. Davis. *Engineering and Mining Journal,* v. 150, Oct. 1949, p. 85.

Unusual Esperanza-type classifier in a special circuit for regrinding Cu flotation concentrate.

1C-74. Capturing Copper From Mine Water. Arthur Hoem. *Compressed Air*

Magazine, v. 54, Oct. 1949, p. 260-261.
Modern procedure and equipment used to precipitate copper from mine water.

1C-75. Laboratory Experiments on Aluminum and Zinc Dusts as Precipitants of Gold in Cyanidation Practice. W. Hutchings. *Canadian Mining Journal,* v. 70, Oct. 1949, p. 74-79.
Experiments which show that Al dust is an effective precipitant of gold under many conditions where Zn dust is not. Use of Al dust may prove to be the solution of a great many mill operators' problems. 15 ref.

1C-76. Physical Chemistry of Precipitation Accelerators. H. L. Noblitt. *Canadian Mining Journal,* v. 70, Oct. 1949, p. 87-89.
Basic principles applied to the precipitation of cyanided precious metals by Zn dust.

1C-77. Factors Affecting the Rate of Formation of Zinc Ferrite From Zinc Oxide and Ferric Oxide. D. W. Hopkins. *Bulletin of the Institution of Mining and Metallurgy,* Oct. 1949, p. 1-21.
See abstract from *Journal of the Electrochemical Society,* item 1C-69, 1949.

1C-78. Milling Practice on the Golden Mile. S. G. Salamy. *Deco Trefoil,* v. 13, Sept.-Oct. 1949, p. 7-14.
Previously abstracted from *Mine & Quarry Engineering.* See item 1C-35, 1949.

1C-79. Depression of Pyrite and Arsenopyrite During Flotation in a Basic Medium. (In Russian.) I. N. Plaksin and A. M. Okolovich. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), June 1949, p. 907-922
The action of bases [NaOH and $Ca(OH)_2$] as depressors. Activation of arsenopyrite by copper ions (from $CuSO_4$).

1C-80. Rare Earth Metals in "Mass" Production. *Product Engineering,* v. 20, Nov. 1949, p. 120.
Method used to separate and purify the rare metals formed by uranium fission. Ion-exchange-resin columns, 8 ft. tall and 4 in. diam. are used. Oxides of more than 99% purity are produced, then "smelted" to produce tiny ingots—tiny 1/20-oz. cylinders of praseodymium and neodymium and comparatively massive 1.3-lb. chunks of cerium and lanthanum.

1C-81. The Metallurgy of Cobalt. W. H. Dennis. *Mining Magazine,* v. 81, Sept. 1949, p. 144-146; Oct. 1949, p. 215-218.
Extraction of Co and its uses.

1C-82. Concentration of Oxide Manganese Ores From Payday No. 1 and Newcomb Properties, Weber and Rich Counties, Utah. J. A. McAllister and Walter J. Long, Jr. *U. S. Bureau of Mines,* Report of Investigations No. 4524, Sept. 1949, 9 pages.
Methods of concentration.

1C-83. Treatment of Gold Ore From the Ambassador and Vanderbilt Lodes, Cowarra Mine, Cowra Creek, N. S. W. K. S. Blaskett and H. H. Kunkin. *Metallurgical Laboratory, University of Melbourne,* Ore-Dressing Investigation No. 317, Jan. 20, 1949, 13 pages.
Compares ore samples from the Ambassador and Vanderbilt lodes with those from the Cowarra mine as to analysis and cyanidation.

1C-84. (Book) **Gold Extraction for the Small Operator. Ed. 2.** 103 pages. Imperial Chemical Industries, Ltd., London, England.
History and brief details of the principal rock formations in which gold appears. Crushing and grinding, amalgamation, use of strakes, refining of bullion, leaching with cyanide solutions, testing of such solutions, precipitation, filling and dressing of zinc boxes, clean-up, acid treatment, and smelting of the precipitate. Concentration and flotation and special methods for the treatment of difficult ores. Safety measures in handling cyanide, conversion tables, tank capacities, and other useful data.

1C-85. (Book) **A Tantalita do Nordeste; Sua Exportacao e Analise.** (Tantalites of Northeastern Brazil; Their Exportation and Analysis.) Morris Slavia, Cássio Mendonca Pinto, and Mário da Silva Pinto. 75 pages. 1946. Laboratorio da Producao Mineral, Departmento Nacional da Producao Mineral, Ministério da Agricultura, Rio de Janeiro, Brazil. (Bulletin No. 21.)
Statistical information concerning tantalite deposits; export regulations; development of an improved Schoeller method for determination of Ta in tantalites. Also a rapid method for classification of the ores based on relationship of specific gravity and Ta_2O_5 content.

1C-86. Milling and Metallurgy at Central Patricia Gold Mines. D. L. McCann. *Canadian Mining Journal,* v. 70, Nov. 1949, p. 84-90.
Extraction procedures. Mineralogical characteristics of the ore.

1C-87. Milling at Pickle Crow. W. M. McLellan. *Canadian Mining Journal,* v. 70, Nov. 1949, p. 113-116.

Extraction of gold in south central Canada. Includes mill flowsheet.

1C-88. Concentration of Oxide Manganese Ores From the Tintic District, Eureka, Juab County, Utah. A. O. Ipsen, H. D. Snedden, and H. L. Gibbs. *U. S. Bureau of Mines,* Report of Investigations 4545, Nov. 1949, 18 pages.

Marketing specifications. Nature and method of concentration of above ores.

1C-89. Concentration of Manganese Ores From Piute and Kane Counties, Southern Utah. Richard Havens and W. W. Agey. *U. S. Bureau of Mines,* Report of Investigations 4551, Nov. 1949, 9 pages.

Various methods of concentration, including jigging, tabling sized fractions, selective flotation, washing, and sizing.

1C-90. Flotation of Silver Chloride From an Oxide Ore. A. L. Engel and T. A. Jackson. *U. S. Bureau of Mines,* Report of Investigations 4574, Nov. 1949, 5 pages.

Results of cyanidation and flotation tests. A flotation procedure is recommended for its simplicity and satisfactory results.

1C-91. Can Leaching Aid the Copper Mines. Harmon E. Keyes. *Journal of Metals* (Technical Section), v. 1, Nov. 1949, p. 29-31.

The only living member of the original Tainton technical staff that operated the Martinez electrolytic-zinc plant and proved that commercial soundness of high acid-high current density deposition of zinc tells of tribulations encountered in that early work. It is then suggested that copper leaching may well have a great deal in common with zinc hydrometallurgy and that several proven metallurgical processes could be integrated into complete operations adaptable to a wide variety of copper-mine conditions.

1C-92. Titanium Investigation: The Laboratory Development of Mineral-Dressing Methods for Arkansas Rutile. M. M. Fine, H. Kenworthy, R. B. Fisher, and R. G. Knickerbocker. *Mining Engineering* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 184), p. 447-452.

Concentrates of rutile TiO_2 were produced by treating submarginal ore from the Magnet Cove district. Rutile recovery at present is 45-50% of the total TiO_2, with the possibility of increased recovery with additional research.

1D—Light Metals

1D-1. The Ammonium Sulphate Process for the Extraction of Alumina From Clay and Its Application in a Plant at Salem, Oregon. W. R. Seyfried. *Metals Technology,* v. 15, Dec. 1948, TP 2473, 12 pages.

It is the opinion of the Chemical Construction Corp. that the process is workable and capable of producing high-purity alumina from almost any clay or bauxite with few, if any, limitations as to chemical analysis or physical conditions of the raw material. 33 ref.

1D-2. Investigation of Black Mountain Beryl Deposit, Oxford County, Maine. E. E. Maillot, Margaret F. Boos, and McHenry Mosier. *U. S. Bureau of Mines,* Report of Investigations No. 4412, Feb. 1949, 10 pages.

Includes a brief summary of results of metallurgical testing. No method of flotation was found that was successful in separating the beryl and spodumene; but by employing heavy-medium separation to remove spodumene, 75.4% of the BeO was recovered in a flotation concentrate assaying 10.4% Be.

1D-3. Distribution of Impurities in Crystallization of Ammonium and Potassium Alums. David Schlain, John D. Prater, and S. F. Ravitz. *Industrial and Engineering Chemistry,* v. 41, Apr. 1949, p. 834-841.

Study was made because the crystallization of ammonium or potassium alum is an important step in several processes proposed for recovery of alumina from clays and alunite. 20 ref.

1D-4. Investigation of Certain High-Alumina Clays of Central Pennsylvania. Robert S. Sanford. *U. S. Bureau of Mines,* Report of Investigations 4427, Mar. 1949, 12 pages.

The method studied for extracting and recovering high-grade alumina comprised sintering pulverized ore with limestone and soda ash to convert alumina to a water-soluble form and silica to compounds virtually insoluble in water or dilute alkalies. Beneficiation tests.

1D-5. The System Aluminum Sulfate-Sulfuric Acid-Water at 60°. Jack L. Henry and G. Brooks King. *Journal of the American Chemical Society,* v. 71, Apr. 1949, p. 1142-1144.

Part of a study being made in connection with the development of an alumina-from-clay extraction process. 14 ref.

1D-6. A Brief Description of Shantung Bauxite and Extraction of Alumina by the Wet Process. H. I. Yuan, F. C. Kou, and Y. O. Huang. *Science & Technology in China,* v. 2, Apr. 1949, p. 21-24.

1D-7. Lime-Soda Sinter Process for Alumina From High-Silica Bauxites: Laboratory and Pilot-Plant Tests. John E. Conley and Milford L. Skow. *U. S. Bureau of Mines,* Report of Investigations 4462, June 1949, 67 pages.

Details of laboratory and pilot-plant tests. Steps include grinding, pelletizing, sintering, extraction, desilicating, carbonating, washing and calcining. A soda-recovery step allows recycling of this material. Tests were made on both Georgia and Arkansas bauxites. Satisfactory results were obtained with bauxite containing 20.6% SiO_2.

1D-8. Die Grundlagen der wirtschaftlichen Verarbeitung von Rotschlamm. (The Principles of the Economic Processing of Red Mud.) Friedrich Vogel. *Metall,* July 1949, p. 223-225.

Why proposed methods for processing red bauxites are industrially uneconomical. Importance of devising a method of extracting from these minerals not only the iron and the titanium oxide but also the alumina and the sodium oxide.

1D-9. Alumina by the Bayer Process. *Industrial Chemist and Chemical Manufacturer,* v. 25, Sept. 1949, p. 431-438.

Comminution of the ore, alkaline digestion, removal of silica, and precipitation of hydrate or alumina at a British plant.

1D-10. Recovery of Alumina From Submarginal Bauxites. Part 1. Electric Furnace Production of Calcium Aluminate and Ferro-Alloy. Charles E. McCarthy, Richard S. Cole, Earl F. Nichols, Hewitt Wilson, and John A. Ruppert. **Part 2. Extraction of Alumina From Electric-Furnace Slags of Calcium Aluminate.** Maurice R. Thompson, Henry M. McLeod, Jr., and Milford L. Skow. ***U. S. Bureau of Mines,*** Report of Investigations 4527 and 4528, Nov. 1949, 93 and 91 pages.

107 references.

1D-11. Differential Thermal Analysis Applied to the Lime-Soda Sinter Process. A. J. Kauffman, Jr. *U. S. Bureau of Mines,* Report of Investigations 4585, Nov. 1949, 16 pages.

Method of analysis and survey of investigations of reactions in the dry state. Data are applied to the recovery of alumina from siliceous bauxite, kaolin, and other high-alumina materials. 47 ref.

SECTION II

SMELTING, REDUCTION and REFINING

2A—General

2A-1. The Problems of Heat Conductivity in Solids. III. (In Russian.) V. S. Pushkin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Aug. 1948, p. 1044-1050.

Proposes a new theory of melting and attempts to interpret it mathematically as a function of a space-time system of coordinates. The analytical-empirical method formerly used and the theoretical method proposed by the author are compared.

2A-2. Melting and Refining Fluxes; Properties, Purposes and Effects of Modern Reducing Agents. E. R. Thews. *Metal Industry,* v. 73, Dec. 24, 1948, p. 511-513; Dec. 31, 1948, p. 523-525.

Refining of scrap or virgin metal.

2A-3. Electrical Efficiency During Electrolysis of Fused Salts. (In Russian.) A. L. Rotinyan. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 755-764.

Proposes a new differential equation expressing the dependence of yield on current used, taking into consideration the influence of temperature and distance between electrodes. Experimental data from the literature confirm validity of the proposed equation. 10 ref.

2A-4. Problems in the Study of Ferrosilicon With High Silicon Contents. (In Russian.) A. A. Trots and M. S. Maksimenko. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 775-780.

A series of problems connected with the behavior of the above ferrosilicon during treatment were investigated; for instance: composition and amount of liberated gases, explosive characteristics, toxicity, etc.

2A-5. The Soderberg Electrode System. Herman Christiansen, Jr., and B. Ydstie. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 98-100.

Method of manufacture of the electrode paste. The purest materials are required for electrodes for use in steel and aluminum furnaces. In smelting furnaces, the Soderberg electrode system is said to have a number of important advantages over other types of electrode. Extensive tests are being carried out to perfect the performance of the electrodes in steel furnaces. A new type of electrode system, employing vertical contact stubs, has simplified the operation of Al furnaces, and has made possible a high degree of mechanization. Furnaces using this system are completely closed. Fluorine and SO_2 are removed from the furnace gases and their adverse effects are entirely eliminated.

2A-6. Otazka okyslicovani kovu. (The Problem of the Oxidation of Metals.) A. Krupkowski. *Hutnicke Listy,* v. 3, Dec. 1948, p. 357-361.

Derives an equation for calculation of the free energy of chemical reactions. A table compiled with the aid of this equation enables one to determine the affinity of individual metals for oxygen and thus the comparative ability to remove impurities from molten metals at temperatures in excess of 1000° C.

2A-7. (Book) **The Chemistry of Process Metallurgy.** 344 pages. Gurney and Jackson, 98 Great Russell St., London, England. (Discussions of the Faraday Society, no. 4, 1948.) 30s.

A symposium held at Ashorne Hill, Warwickshire, England, Sept. 23-25, 1948. Introductory address by Andrew McCance; 26 papers dealing with general principles, metallic solutions, roasting and reduction processes, slags, and refining processes; general discussions. Individual papers were previously abstracted separately from *Faraday Society Transaction,* Preprints, Sept. 1948.

2A-8. Thermodynamics of Basic Met-

allurgical Slags. (In Russian.) V. A. Kozheuvov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry) v. 23, Apr. 1949, p. 484-496.

Using as an example the distribution of oxygen between metal and basic slags, consisting of FeO, MnO, CaO, MgO, and SiO_2, it is shown that, during determination of the thermodynamic properties of siliceous systems, they should be considered as consisting only of the simplest ions. 14 ref.

2A-9. Sur la chimie des solutions métalliques diluées. (Chemistry of Dilute Metallic Solutions.) Léon Jollivet. *Comptes Rendus* (France), v. 228, June 20, 1949, p. 1944-1946.

A theoretical analysis of refining processes based on addition to molten metals of certain elements. A formula is deduced for the relation between concentration of added elements, concentration of the base metal, and absolute temperature of the process. From this formula composition of the resulting compounds and heats of their formation may be determined.

2A-10. Influence de l'intervalle de solidification sur la coulabilité des laitiers sidérurgiques. (Influence of Solidification Range on the Fluidity of Metallurgical Slags.) Paul Bastien. *Comptes Rendus* (France), v. 229, July 4, 1949, p. 50-51.

Attempts to establish laws governing the above, similar to those already established for metallic alloys. Experimental data agree with theoretical conclusions.

2A-11. Investigation of Ingot Solidification in Connection With Distribution of Temperatures. (In Russian.) V. M. Breitman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 633-636.

Method of approximate calculation of movement of the crystallization front in a cylindrical ingot, having minimum information concerning temperature distribution. This method permits determination of the rate of growth of the solidifying outside layer on the basis of temperature changes within the layer and on its surface. As examples, calculations are presented for a paraffin block and for two steel ingots.

2A-12. Physico-Chemical Principles in Process Metallurgy. Charles F. Goodeve. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 9-23.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-21, 1948.

2A-13. Activities in Liquid Metallic Solutions. John Chipman. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 23-49; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-22, 1948.

2A-14. Roasting and Reduction Processes—A General Survey. C. W. Dannatt and H. J. T. Ellingham. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 126-139; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-20, 1948.

2A-15. Studies in the Thermodynamics of Metallurgical Reduction Processes by Electrochemical Methods. B. A. Rose, G. J. Davis, and H. J. T. Ellingham. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 154-162; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-19, 1948

2A-16. A Kinetic Study of the Dissociation of Carbon Monoxide Accompanying the Reduction of Metallic Oxides. A. Juliard, R. Rayet, and A. Ludé. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 193-196; discussion, p. 217-244. Translated from the French.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-15, 1948.

2A-17. The Reduction of Zinc Sulphide by Iron Under Reduced Pressure. P. Gross and M. Warrington. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 215-217; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-16, 1948.

2B—Ferrous

2B-1. Use of Oxygen for Decarburization and Melting in the Electric Furnace. J. H. Eisaman. *Industrial Heating,* v. 15, Dec. 1948, p. 2120, 2122, 2124. A condensation.

Previously abstracted from *American Iron and Steel Institute, Preprint,* 1948, item 2b-128, 1948.

2B-2. Quality Control in the Open Hearth. Part I: Problems From Sulfur in the Open Hearth. Frank G. Norris. *Industrial Heating,* v. 15, Dec. 1948, p. 2126, 2128, 2130.

Reviews paper by L. R. Berner presented at 31st annual meeting of the Open Hearth Steel Committee of the AIME.

2B-3. Production of Electric Arc Furnace Steel. Walter M. Farnsworth. *Steel,* v. 123, Dec. 20, 1948, p. 96, 98, 101, 103, 106, 108; Dec. 27, 1948. p. 76, 78, 80, 82, 84, 86, 88.

Equipment and procedures. (Part I of the first of a series of 27 articles on making and fabrication of steel.)

2B-4. Research on Gas Mixtures; Some Substitutes in Continental Steel Making. *Chemical Age,* v. 59, Dec. 4, 1948, p. 753-754.

Recent work.

2B-5. Oxygen in Manufacturing Electric Furnace Steel. *Journal of Metals,* v. 1, sec. 1, Jan. 1949, p. 10-12.

Summarizes paper by J. H. Eisaman, presented at May 1948 meeting of AISI; as well as additional information for both basic and acid practice, reported at the 1948 Electric Furnace Steel Conference of AIME.

2B-6. The Interaction of Liquid Steel With Ladle Refractories. Carl B. Post and George V. Luerssen. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 15-26.

Step-down data and operating conditions for two grades of SAE steels. If furnace, ladle, and pit practices are kept reasonably constant, there is a relationship between Mn and Si ratio in the two grades of steel and the resulting cleanness. Performance records of a new deep hardening roller-bearing steel in which the Si content is adjusted to balance the high Mn content. Chemical analysis of many heats of steel and of the corresponding slag-buttons and slag-patches from the sides of ingots. Equilibrium between silicate slags containing FeO and MnO and molten steel containing Mn, Si, and FeO in solution.

2B-7. The Influence of Temperature on the Affinity of Sulphur for Copper, Manganese, and Iron. E. M. Cox, M. C. Bachelder, N. H. Nachtrieb, and A. S. Skapski. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 27-31.

Equilibrium constants of the reactions of FeS, MnS, and Cu_2S with H_2 were measured over a range of temperature wide enough to establish dependence of these constants on temperature. Equilibrium pressures of S_2 over the respective sulphides and free energy of their formation were calculated. It is concluded that metallic copper present in scrap will pick up sulphur from the openhearth gases.

2B-8. Factors Affecting the Quality of Rimming Steel Ingots. John A. Warchol. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1461-1462, 1469.

Recommended procedures.

2B-9. Open Hearth Charge and Feed Oxides. Barney D. McCarthy. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1475, 1512-1513.

Characteristics of ideal basic open-hearth and electric-furnace iron ores (charge oxides). Ore blocks made from Mt. Hope magnetite concentrates; their properties and superior characteristics.

2B-10. Evolution in Steelmaking. J. D. Knox. *Steel,* v. 124, Jan. 3, 1949, p. 140-142.

Recent developments.

2B-11. Appleby-Frodingham; Open-Hearth Furnaces and Other Developments. *Iron and Steel,* v. 21, Dec. 1948, p. 607-610.

Facilities of British firm, with emphasis on melting and ingot casting.

2B-12. Blast Furnace Pig Iron; American Classification and Grading Schemes. J. E. Hurst. *Iron and Steel,* v. 21, Dec. 1948, p. 611-613. Condensed from Section I. Steel Products Manual. American Iron & Steel Institute (Pig Iron and Ferro Alloys).

Includes section on sampling of pig iron.

2B-13. Steel Capacity. G. F. Sullivan. *Iron Age,* v. 163, Jan. 6, 1949, p. 198-205.

U. S. steelmaking potential was increased 2,350,000 tons in 1948 by a combination of new melting equipment and technological improvements. An additional 2,744,000 tons will be available by 1950. New facilities and new production ideas.

2B-14. Pig Iron. T. G. Johnston. *American Iron and Steel Institute,* 1948, 6 pages.

History, manufacture, use, and what has been accomplished with respect to standardization.

2B-15. The Effect of Raw Materials on Steelmaking. K. L. Fetters, E. G. Hill, H. C. Smith, and C. H. Herty, Jr. *American Iron and Steel Institute,* 1948, 10 pages.

Product requirements and steelmaking processes; requirements of ore, coke, limestone, pig iron, scrap, fuel gas or oil, and refractories for most satisfactory results.

2B-16. La fase "fossa" nel ciclo di fabbricazione dell'acciaio. (Importance of Ingot Casting in Steel Production.) Guido Calbiani. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 177-187.

Influence of the method of casting on quality of the product. Factors involved, such as size of ingots, rate of cooling, composition of molds.

2B-17. 15-Minute Pig Iron. Les Morrow. *Canadian Metals and Metallurgical Industries,* v. 12, Jan. 1949, p. 14-16, 26.

Special electrically operated unit. Portable and semi-portable plants are to be installed at ore beds for the reduction of ore to pig iron. The present plant has a capacity of 500 lb. per hr. and is strictly a demonstration unit. Raw ore is fed into a hopper, crushed, screened, pulverized, classified, weighed, mixed, and briquetted. The preheated briquets are reduced to semi-steel or high-grade pig iron in the reduction furnace. If further refining is desired, the melt is transferred to the compounding furnace and there finished to steel.

2B-18. Oxygen Speeds Production of Stainless Steels in the Electric Furnace. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 62. Based on report by A. C. Ogan.

Experiences in Electric Furnace Dept., Duquesne Works, Carnegie Illinois Steel Corp.

2B-19. Review of Iron Sintering for 1948. E. W. Shallock. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 65-66.

History of commercial sintering installations, not only for 1948, but since the first plant was built in 1906.

2B-20. Developments in Open Hearth Practice. Charles Fondersmith. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 71-73.

Reviews 1948 developments.

2B-21. Progress in the Electric Furnace During the Year 1948. W. J. Reagan. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 74-76.

Electric-furnace production of steel.

2B-22. The A.I.M.E.'s 1948 Electric Furnace Steel Conference. *Metal Progress,* v. 55, Jan. 1949, p. 52-54.

Reviews proceedings.

2B-23. Uses Oxygen Enriched Cupola Blast. *Iron Age,* v. 163, Jan. 27, 1949, p. 65. Based on recent article in *Pig Iron Rough Notes.*

2B-24. Distribution of Oxygen Between Metal and Basic Slag From the Point of View of Ionic Theory. (In Russian.) O. Esin and V. Kozheurov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, July 1948, p. 765-774.

Analyzes the experimental data of Chipman and associates from the point of view of Timkin's theory of perfect ionic solutions. Coefficients of activity of ferrous oxide characterizing the deviation of the molten-slag behavior from that of an ideal ionic solution were determined. 10 ref.

2B-25. Production of Open Hearth Steel. L. F. Reinartz. *Steel,* v. 124, Jan. 17, 1949, p. 76, 78, 80, 82, 84, 87, 90, 92, 95; Jan. 24, 1949, p. 68, 70, 72, 75-76, 78, 80; Jan. 31, 1949, p. 82, 85-86, 88, 90-91; Feb. 7, 1949, p. 106, 109-110, 112, 115-116, 118; Feb. 14, 1949, p. 96, 98, 100, 102, 105-106.

Procedures and equipment. Part I emphasizes furnace design and refractories. Part II deals with handling of raw materials, charging equipment, and operating procedures. Types of scrap suitable, and sampling for carbon analysis. Part III deals mainly with handling equipment. Part IV describes differences in results obtained by the acid and basic processes. Photographs show ingot structures. Part V describes the cross-regenerative firing system used with today's furnaces. Detailed drawings of oil and natural-gas burners; a description of control systems; an organization chart for an eight-furnace openhearth shop.

2B-26. Relation Between Chromium and Carbon in Chromium Steel Refining. D. C. Hilty. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 91-95.

Equilibrium constant and influence of temperature on it were derived for the iron-chromium-carbon-oxygen reaction in the practical range of chromium steel composition. Experimental setup and results.

2B-27. The Ionic Nature of Metallurgical Slags. Simple Oxide Systems. John Chipman and LoChing Chang. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 191-197.

Examines, in the light of ionic theory, recent data on slag-metal and slag-gas equilibria, in order to obtain a more complete or more satisfactory generalization than has been possible on the single basis of either simple compound formation or complete ionization. 17 ref.

2B-28. Jet Caster Speeds Tap Hole Opening. *Iron Age,* v. 163, Feb. 17, 1949, p. 85, 162. Based on paper by B. S. Old and A. R. Almeida.

New method for opening tap holes in blast furnaces, openhearths and other types of metallurgical furnaces, said to give promise of overcoming disadvantages of the oxygen lance. The device used is a capsule containing an insulated cone-shaped explosive charge.

2B-29. Quality Control in the Open Hearth. Part II: Control of Sulfur in Open Hearth Steel Making Process. Frank G. Norris. *Industrial Heating,* v. 16, Jan. 1949, p. 86, 88.

Sulfur content of the iron and coke; fuel used; factors affecting sulfur content; additions to the furnace; type of flame. (To be continued.)

2B-30. Sull'esistenza di un punto critico nell'affinazione dell'acciaio. (Existence of a Critical Point During the Refining of Steel.) Fausto Castagneri. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 230-232.

A theoretical study. Existence of a critical point (minimum oxygen content) is indicated. See also *La Metallurgia Italiana,* May-June 1947; item 2b-177, 1948.

2B-31. Distribution of Oxygen and Sulfur Between Molten Iron and Basic Slags. (In Russian.) A. M. Samarin and L. A. Schvarsman. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk.* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Sept. 1948, p. 1457-1462.

On the basis of a theory, developed by Temkin, of the ionic nature of fused salts, the authors propose equations for determination of the above. Experimental data agree with the theory; however, agreement for distribution of oxygen is less close than for sulfur. Method of application of proposed equations.

2B-32. (Book). **Iron and Steel.** J. H. Chesters. 116 pages. Thomas Nelson and Sons Ltd., Parkside Works, Edinburgh 9, Scotland. 5s. net.

Production of iron and steel. Raw materials, methods of manufacture, and tests are described in language understandable to nonscientific readers. A brief historical review explains how the properties of the metals were first discovered, and gives an outline of the evolution of the various processes in use today.

2B-33. (Book). **Metallurgiya Chuguna. I. Vvedenie; Cyrye Materialy.** (Metallurgy of Cast Iron. I. Introduction; Raw Materials.) Ed. 3. M. A. Pavlov. 250 pages. 1948. Academy of Sciences of the USSR, Moscow and Leningrad.

Short review of methods used in the USSR and abroad, plus a comprehensive study of raw materials and their applicabilities to different production methods. World-wide resources of low and high-grade ores, fluxes and fuels used. Intended for research workers and advanced students. 109 ref.

2B-34. Use of Oxygen (or Compressed Air) in the Open Hearth Furnace. Frank G. Norris. *Industrial Heating,* v. 16, Feb. 1949, p. 272, 274, 276. A condensation.

Carbon elimination in the open-hearth, the rate of injection, rate of carbon elimination, time restrictions, bottom delay, heat time and quality considerations; use of oxygen or compressed air for flame enrichment; and use of hot metal for desiliconization.

2B-35. Jet Caster Technique Speeds Tapping of Blast Furnaces and Open Hearths. *Steel,* v. 124, Feb. 21, 1949, p. 108, 110-111, 114, 130.

See abstract from *Iron Age,* item 2B-28, 1949. This article also summarizes several other papers presented at the winter meeting of the Eastern States Blast Furnace and Coke Oven Association. Subjects covered are: hard-fired blast-furnace linings; use of carbon linings in blast furnaces; chemical cleaning of gas-cleaning equipment; and blending of coal to improve coke quality.

2B-36. Coke Ash and Coke Sulfur in the Blast Furnace. H. H. Lowry. *Industrial and Engineering Chemistry,* v. 41, Mar. 1949, p. 502-510.

An evaluation, in part qualitative and in part quantitative, of the importance of the coke ash and sulfur on the operation of a furnace and on the quality of the iron produced. Inadequate control of other operating variables is believed to be often responsible for disproportionate blame for poor furnace performance being assigned to coke quality. 70 ref.

2B-37. Production of Tool Steel. George A. Roberts and Charles F. Sawyer. *Steel,* v. 124, Feb. 28, 1949, p. 102, 105-106, 108, 111; Mar. 7, 1949, p. 118, 120, 123-124.

Equipment and procedures. First installment: melting, refining, and ingot casting. Concluding installment: soaking pit practice; billet forging; billet rolling; annealing of billets and bars; procedures for inspection of intermediate and finished products; and miscellaneous procedures.

2B-38. Iron and Steel Producers. Walter Carroll. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 107-111.

1948 developments in commerce and technology of steelmaking.

2B-39. Canadian Steel; Open-Hearth Practice at Algoma. Norman F. Dufty.

Iron and Steel, v. 22, Feb. 1949, p. 45-48.

Raw-materials and fuel used; furnaces, refractories, and auxiliary equipment; general procedures.

2B-40. Basic O.H. Ingots; A Statistical Investigation of Cracking. I. M. Mackenzie and A. J. Donald. *Iron and Steel,* v. 22, Feb. 1949, p. 59-61.

The method of multiple graphical correlation. Statistical analysis shows that furnace practice has a considerable influence on the cracking of ingots of basic openhearth steel. (See also item 2b-205, 1948.)

2B-41. Steelmaking in a British Foundry. Norman F. Dufty. *Foundry,* v. 77, Mar. 1949, p. 82-83, 248-250, 252.

Practice with the acid-lined electric-arc furnace.

2B-42. An Evaluation of Steel Cleanliness. Philip Schane, Jr. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 3-7; discussion, p. 7-13.

Previously abstracted from condensed version in *Blast Furnace and Steel Plant.* See item 2b-30, 1948.

2B-43. Deoxidation and Deoxidation Products in Electric-Furnace Steel. Sidney W. Poole. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 13-18; discussion, p. 18-22.

Effects of various deoxidation practices on quality. Determination of inclusions formed in large heats by metallographic and other means. Factors involved in elimination of inclusions. 10 ref.

2B-44. Problems Associated With the Production of Sound Ingots. R. L. Stephenson. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 32-41; discussion, p. 41-42.

See abstract from *Western Machinery and Steel World,* item 2b-41, 1948.

2B-45. Large Ingots. Francis B. Foley. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 43-45; discussion, p. 45-49.

See abstract from *Industrial Heating,* item 2b-166, 1948.

2B-46. Production of Sound Billet-Type Ingots. B. C. Blake. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 49-51; discussion, p. 51.

Ladle technique, pouring small ingots, and stripping and yields of the above.

2B-47. The Dornin Process. George A. Dornin, Jr. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 52-57; discussion, p. 57-58.

Method of producing sound steel without hot tops which was successfully used in the production of 17,000 tons of electric furnace steel during a three-year development period.

2B-48. Estimating Costs of Industrial Oxygen. Martin J. Conway and James J. Hogan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 67-73; discussion, p. 73-78.

Advantages of using pure oxygen in the production of steel. Low-pressure continuous process for producing oxygen and calculation of unit cost. Schematic flow sheet.

2B-49. Effect of Mold Thickness and Cooling on Base Quality of Intermediate Size Ingots. George Breyer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 59-63; discussion, p. 64-66.

Effect of teeming temperatures and mold thickness on nature, occurrence, and distribution of inclusions and surface defects.

2B-50. Present Applications of Oxygen in Electric-Furnace Steelmaking. J. H. Berryman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 78-81; discussion, p. 89-93.

Use of oxygen in melting scrap, in controlling bath temperature, and in accelerating decarburization.

2B-51. Some Aspects of the Use of Oxygen in the Electric Furnace. J. M. Gaines and G. M. Skinner. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 82-88; discussion, p. 83-93.

Recent information from a practical viewpoint.

2B-52. A Quantitative Experimental Investigation of the Hydrogen and Nitrogen Contents of Steel During Commercial Melting. Clarence E. Sims, George A. Moore, and Donald W. Williams. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 106-124; discussion, p. 124-130.

Previously abstracted from *Metals*

Technology. See item 2b-33, 1948.

2B-53. A Rational Process for the Improved Manufacture of Steel Without Inclusions. Georges Ranque. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 130-147; discussion, p. 147-150.

Conditions of formation and stability of inclusions and an operative process attempting to eliminate or minimize them. Laws of physical chemistry and physics that apply to liquid slag-metal systems.

2B-54. Recovery of Vanadium and Other Alloys in the Acid Electric Furnace. Clyde Wyman and George W. Johnson. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 203-223; discussion, p. 223-227.

Efficiency of alloy recovery from residuals contained in the bath. A series of 24 heats was produced and studied at the Burnside Steel Foundry Co.

2B-55. Review of Known Factors Controlling Slag Volume. Charles Locke. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 228-234; discussion, p. 256-260.

13 ref.

2B-56. Effect of Bottom Shape and Life on Slag Volume in Acid Electric Furnace. J. A. Bowers. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 235-238; discussion, p. 256-260.

Investigation carried out in two 1000 lb. per hr. Lectromelt top-charge furnaces.

2B-57. Effect of Extent of Bottom Repairs on Slag Volume in Acid Electric Furnace. J. D. Cannon. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 238-240; discussion, p. 256-260.

Slags from 0.25 to 0.35% plain carbon steels melted in a 3-ton, acid-lined Lectromelt furnace with a 2500-kva. transformer.

2B-58. Effect of Bank Repairs on Slag Volume in Acid Electric Steelmaking. F. B. Eiseman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 241; discussion, p. 256-260.

It is concluded that no basis for comparison of the above is feasible.

2B-59. Effect of Cleaned vs. Uncleaned Foundry Scrap on Slag Volume. W. L. Doyle. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 243; discussion, p. 256-260.

Four slag weights were studied.

2B-60. Effect of Metal Depth on Slag Volume in Electric Furnace. M. T. McDonough. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 245; discussion, p. 256-260.

Experimental data.

2B-61. Effect of Temperature and of Basic Additions on Slag Volume in the Electric Furnace. J. B. Caine and G. R. McDaniels. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 248-250; discussion, p. 256-260.

Investigation at Sawbrook Steel Castings Co.

2B-62. Effect of Iron-Ore Additions on Slag Volume in the Electric Furnace. H. R. Hoffman. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metalurgical Engineers,* v. 5, 1947, p. 250-254; discussion, p. 256-260.

Experimental conditions.

2B-63. Effect of Manganese Ore on Slag Volume. C. C. Spencer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 254-255; discussion, p. 256-260.

Results of investigation.

2B-64. Effect of Time of Heat on Slag Weight in the Electric Furnace. R. H. Frank. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 255-256; discussion, p. 256-260.

Data tabulated from normal operation at the Bonney-Floyd Co.

2B-65. Melting of Quality Basic Electric Steel. T. V. Simpkinson. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 212-216. A condensation.

The process of melting fully killed steel wherein, after suitable oxidation, the bath is de-oxidized under a reducing slag. Melting of cold scrap charges. (To be continued.)

2B-66. Gaseous Reduction Methods for the Production of Sponge Iron. Edward P. Barrett. *U. S. Bureau of Mines,* Report of Investigations No. 4402, Feb. 1949, 45 pages.

Methods proposed or tried during the past 100 years. 194 ref.

2B-67. Die Manganausnutzung beim basischen Siemens-Martin-Verfahren. (The Utilization of Manganese in the Basic Openhearth Furnace.) Walter Krauskopf. *Stahl und Eisen,* v. 68, Mar. 25, 1948, p. 123-124.

A critical discussion of recent articles by H. J. Krabiell and C. Schwarz.

2B-68. Physikalisch-chemische Grundlagen der Verfahren der Eisen- und Stahlerzeugung. (The Physicochemical Principles of Iron and Steel Production.) Willy Oelsen. *Stahl und Eisen,* v. 68, May 20, 1948, p. 175-186.

Published and unpublished literature dealing with research on the metallurgy of iron done in Germany during 1947. 85 ref.

2B-69. Die Hutte Braunschweig der Reichswerke AG. und ihre Betriebsergebnisse in den Jahren 1942 bis 1944. Ein Beitrag zur Nutzbarmachung der Salzgitter-Erze. (The Braunschweig Works of Reichswerke A.G. and Results of Operation During 1942-1944. Concerning Utilization of the Salzgitter Ores.) Konrad Hofmann and Eugen Peetz. *Stahl und Eisen,* v. 68, June 17, 1948, p. 213-228; July 15, 1948, p. 255-268.

Includes maps, diagrams, tables, charts, and a graph showing the complete layout. The low-Fe high-Si ores mined in the Salzgitter area were successfully converted into steel by the acid melting process in different types of converters. 21 ref.

2B-70. Die Erzeugung der Ferrolegierungen in Deutschland während der Jahre 1939 bis 1946. (The Production of Ferrous Alloys in Germany During the Years 1939-1946.) Georg Volkert. *Stahl und Eisen,* v. 68, July 15, 1948, p. 268-271.

Methods of producing ferrochromium, manganese alloys, ferromolybdenum, ferrosilicon, ferrotitanium, ferrovanadium, ferrotungsten, and ferrozirconium-silicon. A diagram shows the electro-silico-thermal process of producing high-carbon ferroalloys. 17 ref.

2B-71. Die Oxydfilmtheorie als Grundlage fur die Herstellung von hochwertigem Thomasstahl. (The Oxide-Film Theory as a Basis for Production of High-Test Basic Bessemer Steel.) Gerhard Naeser. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 375-378.

According to the above theory, a film of iron oxide slag between the molten metal and the "incoming" blast prevents the steel from absorbing nitrogen. A method of producing high-test low-nitrogen steels in the basic bessemer converter.

2B-72. Ueber den Stickstoffgehalt von Roheisen. (Concerning the Nitrogen Content of Pig Iron.) Theo. Kootz and Werner Holtmann. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 378-383.

The various factors that determine it directly or indirectly. 42 ref.

2B-73. Stickstoffgehalt von Thomasstahl und Roheisen. (Nitrogen Content of Basic Bessemer Steel and Pig Iron.) Erwin Eickworth. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 383-387.

The nitrogen content increases with the rate of smelting and melting. Experiments show that a slow rate of melting increases the phosphorus content, reducing the "phosphorus period," thus preventing absorption of nitrogen. The P and Si content did not appear to affect the N content of the finished steel.

2B-74. Beeinflussung des Stickstoffgehaltes von Kleinkonverterstahl durch verschiedenartiges Blasen. (Effect of Different Types of Blast on the Nitrogen Content of Steel Made in a Small Converter.) Herbert Jurich and Walter Eilender. *Stahl und Eisen,* v. 68, Oct. 7, 1948, p. 387-395.

The nitrogen content is reduced when the blast passes through the melt at an angle of 10 to 15° to the base of the converter. The increased liquidity of the slag produced no advantages; the addition of ferrosilicon did not increase the N content; and the latter was wholly independent of temperature. 10 ref.

2B-75. Practices Affecting Yields and Surface Quality of Rimmed and Semikilled Steel. Leo R. Silliman. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 14-26.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 2b-124, 1948.

2B-76. Use of Oxygen in Hot Metal for Agitation of the Bath. Henry E. Warren, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 27-33; discussion, p. 33-35.

Experiments with oxygen-nitrogen mixtures.

2B-77. Use of Oxygen (or Compressed Air) in the Open-Hearth Furnace. Frank G. Norris. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 35-41; discussion, p. 41-42.

Previously abstracted from *Industrial Heating.* See item 2B-34, 1949.

2B-78. Operation of Oxygen-Enriched Open-Hearth Furnaces. J. S. Marsh. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 43-54; discussion, p. 54-56.

Previously abstracted from *Metals Technology.* See item 2b-167, 1948.

2B-79. Use of Multiple Burners and Compressed Air to Improve Operating Rates of Open-Hearth Furnaces. Umbert F. Corsini. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 70-73; discussion, p. 73-74.

Previously abstracted from condensation in *Industrial Heating.* See item 2b-143, 1948.

2B-80. Factors Affecting Basic Open-Hearth Operating Rates. Oscar Pearson. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 74-84; discussion p. 84-87. Based on paper by R. H. Ede and J. H. Hoffman.

Work done at the Gary Works metallurgical dept.

2B-81. Oxygen Through the Burner at Granite City Steel Company's Plant. R. C. Solomon. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 88-90; discussion, p. 95-96.

Tabulates results.

2B-82. Metallurgical Oxygen in Cold-Metal Shops. L. L. Whitney. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 91-95; discussion, p. 95-96.

Melting by directing oxygen onto preheated scrap.

2B-83. Use of Oxygen for Carbon Reduction With Cold-Metal Practice. H. M. Parker. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 96-97; discussion, p. 97.

Practice at Armco Steel Corp., Butler, Pa.

2B-84. Use of Compressed Air at Scullin Steel Company. D. J. Murphy. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 98; discussion, p. 98.

Use in openhearth practice for carbon reduction during refining.

2B-85. Compressed Air Used at Granite City. F. von Gruenigen. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 98-100.

Use of compressed air in openhearth practice at American Steel Foundries for the purpose of reducing carbon during the refining period.

2B-86. Use of Compressed Air for Carbon Reduction at Colorado Fuel and Iron Company. W. H. Carpenter. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 100-101.

2B-87. Methods for Improving Furnace Charging. R. R. Fayles. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 102-109; discussion, p. 109-113.

Preparation of scrap and charging procedure.

2B-88. Sulphur Elimination in Cold-Metal Basic Open-Hearth Practice. Charles W. Briggs. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 114-120.

Data contributed by 14 plants.

2B-89. Production of Low-Sulphur Steel to Minimize Hot Tears. G. L. McMillin. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 120-125; discussion, p. 125.

Hot tears, relation of sulfur to them, and elimination of sulfur.

2B-90. Sulphur Elimination in Casting Steel. Clyde B. Jenni. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 125-126.

Effect of sulfur on properties; sulfur control.

2B-91. Sulphur Removal in the Basic Open-Hearth Furnace. John A. Warchol. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 127-132; discussion, p. 132-134.

Metallurgical factors and furnace conditions that affect the sulfur-

removal rate under actual furnace-operating conditions.

2B-92. Surface and Yield of Fully Aluminum-Killed Deep-Drawing Steels. C. W. Conn. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 181-183; discussion, p. 183.

Location of surface defects, interior defects, aluminum additions, and uniformity of aluminum distribution through ingot and heat.

2B-93. Fully Aluminum-Killed, Deep-Drawing Steels. William E. Bayers, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 184-187; discussion, p. 187.

Effect of deoxidation practice on aluminum variation and causes of surface defects.

2B-94. Defects in Fully Aluminum-Killed Deep-Drawing Steel. G. L. Plimpton. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 187-188; discussion, p. 188-189.

Checking, slabs, and cracking and methods for their control.

2B-95. Basic Open-Hearth Slags—Mineralogy and Control. K. L. Fetters. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 190-202; discussion, p. 208-209.

Open-hearth problems and mineralogy and petrography of slags.

2B-96. Sequence of Slag-Forming Minerals in a Heat. J. S. Griffith. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 202-205; discussion, p. 208-209.

Presents two diagrams showing the sequence in which slag-forming minerals occur during a heat and correlates sequence with familiar slag changes.

2B-97. Slag Control—Where Do We Go From Here? W. O. Philbrook. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 205-208; discussion, p. 208-209.

Present status of development; suggests future research program.

2B-98. Some Observations Regarding Desulphurization in the Basic Open-Hearth Furnace. Michael Tenenbaum. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 210-218; discussion, p. 218-225.

Reviews and emphasizes important features.

2B-99. The Use of Blown Metal in Open-Hearth Steelmaking. H. B. Emerick. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 225-227; discussion, p. 227-230.

Previously abstracted from *Blast Furnace and Steel Plant*. See item 2b-125, 1948.

2B-100. Problems From Sulphur in the Open Hearth. L. R. Berner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 232-234; discussion, p. 234-235.

Sulfur from fuel; effect of high-sulfur oil; effects of sulfur in scrap.

2B-101. Effect of Raw Materials Available Now and in the Future on Control of Sulphur in the Open Hearth. Henry E. Warren, Jr. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 236-238; discussion, p. 239-244.

Sources of sulfur; six points for consideration in attaining minimum sulfur.

2B-102. Effect of Manganese Sulphide Alloy on Surface Quality of Billets. L. R. Silliman. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 245-248; discussion, p. 248-249.

Compares the above with resulfurization with stick sulfur. Experimental procedure and conditions.

2B-103. Some Conceptions Regarding the Physical-Chemical Mechanisms of the Acid Open-Hearth Process. Clifford E. Wenninger. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers*, v. 31, 1948, p. 279-293; discussion, p. 293-298.

Relationships depicting mechanisms underlying the divergence in the extremes of the above practice, thus showing how a surplus of either free SiO_2 or free FeO can be concentrated in the center area of an acid slag to promote either an SiO_2:C or an FeO:C reaction for the elimination of carbon. An overall working hypothesis for the above.

2B-104. The Relation of Acid Open-Hearth Furnace Efficiency to Practice. G. R. Fitterer, J. G. Bassett, and J. B. Kopec. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 307-317; discussion, p. 317-319.

The efficiency factor as a guide to apparent efficiency. Variables encountered in practice and over-all economics of the metallurgical phases of openhearth operations.

2B-105. (Book.) **Proceedings of the 31st Conference, National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,** v. 31, 1948, 440 pages. The Institute, 29 W. 39th St., New York 18, N. Y.

Includes McKune award paper on "Practices Affecting Yields and Surface Quality of Rimmed and Semi-killed Steel"; 10 papers on the basic openhearth, 11 on cold-metal operations and "basic foundry practice"; 6 on refractories and masonry; 8 on metallurgy of the openhearth; 7 on quality of openhearth steel; 3 on the acid openhearth; and accompanying discussion. Individual papers are abstracted separately.

2B-106. (Book.) **Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,** v. 5, 1947. 341 pages. The Institute, 29 W. 39th St., New York 18, N. Y.

Papers and discussion presented at the 5th annual conference on electric furnace steel held at Pittsburgh, Dec. 1947. The basic sessions featured the use of oxygen, steel cleanliness, and scrap problems. Individual papers are abstracted separately.

2B-107. Effect of Final Deoxidation on Low-Temperature Impact Strength of Cast Steels. B. A. Lawson. *Foundry,* v. 77, Apr. 1949, p. 74-77, 179-180.

Procedure used to develop deoxidation practices which would produce steel castings possessing both good ductility and low-temperature impact strength in both 0.40-0.50% and 0.20-0.30% C steel. Data on Ti, Al, and Ca-Ti deoxidation.

2B-108. Present Methods of Open-Hearth Furnace Charging. E. L. Diamond and A. M. Frankau. *Journal of the Iron and Steel Institute,* v. 161, Mar. 1949, p. 191-211.

Discusses the various methods and equipment on the basis of extensive time study. Recommendations for improvement.

2B-109. The Influence of Heat Transfer on Open-Hearth Furnace Charging Rate. M. W. Thring. *Journal of the Iron and Steel Institute,* v. 161, Mar. 1949, p. 212-221.

Model experiments and calculations were used to decide whether increase in the rate of charging reduces total melting time. The model consisted of paraffin wax melted by constant radiation from above. Theoretical analysis indicates that it is not advantageous to charge faster than the heat-transfer rate will permit. The ideal charging process is uniform insertion at a rate such that the roof is kept just below the maximum safe value while the fuel is being burned at the maximum rate.

2B-110. Jet Casting for Tapping Blast and Open Hearth Furnaces. Bruce S. Old and A. R. Almeida. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 315-316, 334. A condensation.

See abstract from *Iron Age,* item 2B-28, 1949.

2B-111. Melting of Quality Basic Electric Steel. Part II. (Concluded.) T. V. Simpkinson. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 335-337. A condensation.

Adjustment of analysis and final deoxidation; time under the reducing slag; effects of hydrogen; behavior of hydrogen during steel solidification; and effect of nitrogen.

2B-112. Oxygen: A Review of Its Applications in the Iron and Steel Industry. W. C. Newell. *Iron and Steel,* v. 22, Mar. 1949, p. 77-80.

103 references.

2B-113. Erzeugung von Ferromangan aus minderwertigen Erzen. (Production of Ferromanganese From Low-Grade Ores.) Hans Reinfeld. *Stahl und Eisen,* v. 68, Jan. 29, 1948, p. 39-43.

New reduction method makes it possible to obtain, in one operation, maximum Mn concentration from a minimum Mn charge—with very small loss of Mn and low fuel consumption. This method can be used for the production of specular iron with similar good results.

2B-114. Die Anwendung von Sauerstoff im basischen Siemens-Martin-Ofen. (The Use of Oxygen in the Basic Openhearth Furnace.) Kurt Guthmann and Arno Ristow. *Stahl und Eisen,* v. 68, Jan. 29, 1948, p. 50-52.

Results of various investigations in Germany and abroad.

2B-115. Untersuchungen zur aluminothermischen Gewinnung von Ferrotitan. (Research on the Aluminother-

mic Extraction of Ferrotitanium.) Kirt Giesen and Wilhelm Dautzenberg. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 159-162.

Results of laboratory and large-scale experiments on different factors affecting the aluminothermal reduction to ferrotitanium of crude ilmenite containing 44% TiO_2.

2B-116. Untersuchungen uber Konverterformen und Blasbedingungen zur Erzeugung stickstoffarmen Stahles. (Research on Converter Design and Blast Conditions for the Production of Low-Nitrogen Steel.) Theo. Kootz and Gerhard Gille. *Stahl und Eisen,* v. 68, Aug. 12, 1948, p. 287-294.

Scientific principles of nitrogen pickup in the converter. Experiments with different converters revealed that the "double-bellied" converter produces steel with the lowest nitrogen content. Model tests were made with ammonia to determine conditions of nitrogen pickup and it was found that oscillation of the bath had no effect. 49 ref.

2B-117. Hochofenbetrieb mit erhohtem Gasdruck an der Gicht in Verbindung mit Sauerstoffanwendung und Erzvorbereitung. (Blast Furnace Operation With Increased Gas Pressure at the Throat Combined With the Use of Oxygen and Special Ore Dressing.) Heinz Schumacher. *Stahl und Eisen,* v. 68, Sept. 9, 1948, p. 353-357.

Correlates and summarizes recent American, German, and Russian literature.

2B-118. Production of Rimmed Steel in the Basic Electric Furnace. *Industrial Heating,* v. 16, Mar. 1949, p. 454. Based on article by A. K. Moore.

Practice at Steel Co. of Canada plant.

2B-119. Casting of Slender Ingots. *Industrial Heating,* v. 16, Mar. 1949, p. 456. Based on article by B. C. Blake.

Method of casting billet-type ingots for manufacture of light-gage final products in one conversion.

2B-120. Quality Control in the Open Hearth. Part III. Desulfurization of Pig Iron. Frank G. Norris. *Industrial Heating,* v. 16, Mar. 1949, p. 460, 462.

The desulfurization of pig iron before use in the bessemer process; the amounts and materials used; the time cycle; slag removal; best operating temperature; and the amount of desulfurization.

2B-121. Essais exécutés a l'aciérie Martin de Pompey sur l'enrichissement en oxygène de l'air de combustion. (Experiments on Use of Oxygen-Enriched Air for Combustion in the Pompey Steel Plant.) *L'Institut de Recherches de la Sidérurgie* (Saint-Germain-en-Laye, France), ser. A, No. 2, July 1948, 17 pages and 14 folded charts.

Tests performed on a 47-ton open-hearth furnace converted in 1945 for use of crude oil as fuel. Specifications of the furnace.

2B-122. La désoxydation intégrale de l'acier par l'aluminium. (Integral Deoxidation of Steel by Use of Aluminum.) J. G. Platon. *Revue de Métallurgie,* v. 45, Dec. 1948, p. 512-514.

Various methods for deoxidation of steel, citing advantages of use of Al rather than Si or Mg. Mechanism of Al deoxidation and modern large-scale methods.

2B-123. Beiträge zur Metallurgie des Hochofens. (The Metallurgy of the Blast Furnace.) Willy Oelsen and Helmut Maetz. *Stahl und Eisen,* v. 69, Mar. 3, 1949, p. 147-153.

Results of experimental work on the desulfurization of pig iron and other reactions occurring in the blast furnace. It was found that at temperatures up to 1550° C., reactions between pig iron and slag progress less far than similar reactions of a powdered mixture at temperatures so low that the mixture is still in a solid or semi-solid state. The melt is reduced rapidly above 1600° C. Expected correlations between the various reduction processes were experimentally established.

2B-124. Sulphur Equilibria Between Iron Blast Furnace Slags and Metal. Gerald G. Hatch and John Chipman. *Journal of Metals,* v. 1, sec. 3, Apr. 1949, p. 274-284.

Results of what is believed to be the first equilibrium study of the distribution of S between liquid pig iron and a wide range of blast-furnace-slag compositions. Experimental apparatus and procedure. 23 ref.

2B-125. An Approach to Taconite Utilization. John J. Howard. *Iron Age,* v. 163, Apr. 14, 1949, p. 70-71.

Technical and economic problems involved. Proposed method which reduces iron oxide to metal directly from the taconite. The taconite is ground to minus 40-60 mesh, mixed with coal or coke for reduction, briquetted, and heated to 2500° F. The reduced iron collects in globules and readily separates from the silica, which does not melt below 2900° F.

2B-126. (Book) **The Manufacture of Iron & Steel. Vol. 1.** G. R. Bashforth. 228 pages. Chapman & Hall, Ltd., 37 Essex St., London, W. C. 2, England. 21s.

Textbook intended for technical school students. Blast furnace bur-

den, preparation of iron ores, blast furnace fuel, reactions, slags, design, plant and equipment, refractories, operation and calculations.

2B-127. (Book) **Metallurgie du Fer.** (Metallurgy of Iron.) L. Colombier. 326 pages. 1948. Dunod, 92 Rue Bonaparte, Paris 6, France.

A text for advanced study of the subject. Part I reviews theoretical principles, including thermodynamics and phase transformations. Part II is devoted to large-volume processes for production of iron and steel. Part III describes methods and equipment for producing special steels—mainly electric-furnace processes.

2B-128. The Use of Oxygen for Steel-Making. A. G. Robiette. *British Chemical Digest,* v. 3, Mar. 1949, p. 166-170. Translated and condensed from *Kjemi, Bergvesen og Metallurgi,* v. 8, June 1948.

Use to improve combustion conditions in openhearth process; to assist in degree and speed of refining in the openhearth and the electric arc furnace; to enrich the blast in the bottom or side-blown converter; and to convert pig iron into steel by a blowing process.

2B-129. Some Correlations Between Variables Affecting Sulphur in Blast-Furnace Iron. T. E. Brower and B. M. Larsen. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 28-39; discussion, p. 39-48.

Previously abstracted from *Metals Technology,* item 2b-210, 1949.

2B-130. Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron. Richard W. Heine. *American Foundrymen's Society,* Preprint 8, 1949, 14 pages.

Some effects produced when the deoxidizers Al, Ti, and H_2 are added to white cast irons. Eutectic, sulfide inclusions are produced when the point of complete deoxidation is reached, and oxygen content of white cast iron is considerably higher than heretofore reported. The number of graphite nodules developed during first-stage graphitization is shown to decrease initially with small deoxidizing additions and then to increase rapidly as complete deoxidation is attained with formation of a floccular rather than a nodular type graphite. The roll of oxygen in malleabilization is indirectly demonstrated.

2B-131. The Addition of Oxygen to the Cupola Blast. J. Blakiston. *Foundry Trade Journal,* v. 86, Mar. 31, 1949, p. 289; discussion, p. 289-290.

Potential savings, modified cupola design, advantages, and disadvantages.

2B-132. Rapid Refining by the Ugine-Perrin Method. Albert M. Portvin. *Metal Progress,* v. 55, Apr. 1949, p. 475-481. Translated from the French.

Fine-grained, high-quality steel (exceedingly low in sulfur, oxygen, and visible inclusions) is rapidly and economically produced by using the electric furnace as a melter, slagging off, adding the required alloying elements, and pouring into a ladle containing about 0.1 its weight of specially formulated slag. Adequate refining occurs in the few minutes required to move the receiving ladle to the teeming platform. The process has been in commercial use for a number of years in France and other foreign countries.

2B-133. Effect of Slag Types on Heat Treatment of Malleable Iron. G. Vennerholm and H. N. Bogart. *American Foundryman,* v. 15, Apr. 1949, p. 96-97.

Development of straight electric-furnace melting as a source of white iron for production of malleable iron. The initial investigation consisted of correlating the heat histories, including slag conditions; the heat treat susceptibility of representative castings from these heats; and structure, metallographical and fracture, of the castings. Optimum susceptibility to heat treatment could be obtained by finishing all heats under slags containing less than 18% FeO. Control procedure based on slag color.

2B-134. Oxidizing Steel Heats With Oxygen Gas. *American Foundryman,* v. 15, Apr. 1949, p. 102. Condensed from *International Digest,* Sept. 1948.

Information on use of oxygen gas instead of iron ore as an oxidizing agent in making electric steel.

2B-135. Investigations Relating to Scaffolds in Blast-Furnaces. G. R. Rigby. *Journal of the Iron and Steel Institute,* v. 161, Apr. 1949, p. 295-300.

A scaffold is defined as a deposit on the internal walls of the blast furnace which reduces the cross-sectional area of the furnace. An investigation of their composition and characteristics. Possible mechanisms of formation and methods for their minimization.

2B-136. Production of Bessemer Steel. H. W. Graham. *Steel,* v. 124, Apr. 11, 1949, p. 90-92, 94, 96, 98; Apr. 18, 1949,

p. 114, 116, 118, 120; Apr. 25, 1949, p. 102, 104, 107, 110, 112, 114.

Development since 1860. Size of converters has been increased, various mechanical control means have been proposed and tried, and efficiency of the process has been increased through a more thorough understanding of the thermochemical reactions which take place. Modern converter and production procedure.

2B-137. New Brazilian Sintering Plant Utilizes Waste Charcoal as Fuel. *Steel,* v. 124, Apr. 18, 1949, p. 96.

Plant layout of Belgo-Mineira, steel producer in Brazil. Its unique method of sintering and its use of waste charcoal.

2B-138. The Turbo-Hearth—A New Steelmaking Technique. E. C. Bain and H. W. Graham. *Iron Age,* v. 163, Apr. 21, 1949, p. 62-65.

Development of a method for rapid production of steel of openhearth quality, low in nitrogen and phosphorus. The analysis is achieved by turbulence produced by jets of air impinging on a bath of liquid pig iron. The method has been tested in a 1000-lb. basic-lined experimental unit. Primary advantages of the openhearth and the bessemer are said to be combined.

2B-139. Turbo-Hearth Steelmaking Combines Benefits of Bessemer and Open Hearth. *Steel,* v. 124, Apr. 25, 1949, p. 98.

Process to produce steel low in phosphorus and nitrogen from basic pig iron in a partly closed side-blown vessel using extra heat from more complete combustion of carbon.

2B-140. Progress Report on Nodular Iron. Charles O. Burgess. *Foundry,* v. 77, May 1949, p. 112-115, 218, 220-222, 224-225, 228, 230.

2B-141. The Deoxidizing Properties of Vanadium. (In Russian.) A. M. Samarin and A. Yu. Polyakov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 100-113.

Method of investigation and composition of basic charge. Simultaneous presence of silicon inhibits the deoxidation process. Results permit determination of the thermodynamic function of oxidation of vanadium in liquid iron.

2B-142. More Steel for the Southland. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 70-74.

Equipment and procedures of Los Angeles plant of Bethlehem Pacific Steel Co.

2B-143. Equipment for Extracting Ingots From Their Molds. H. W. Ball. *Iron and Steel Engineer,* v. 26, Apr. 1949, p. 116-120; discussion, p. 120-121.

Functions and design of stripper crane.

2B-144. The Application of Slag Control to the Manufacture of Tube Steel. J. Monaghan. *Engineering,* v. 167, Apr. 1, 1949, p. 294; Apr. 15, 1949, p. 343. A condensation.

Details of methods applied by a British firm.

2B-145. The Equilibrium Between Liquid Silica and Liquid Iron. J. D. Fast. *Philips Research Reports,* v. 3, Aug. 1948, p. 271-280.

Welding-rod coatings contain as a rule a large proportion of SiO_2 and, for that reason, the above equilibrium is of importance in arc-welding technique. The reaction constant for the equilibrium between the pure substances is computed from thermodynamic data and the results obtained are applied to study of actual equilibrium conditions under various circumstances. 15 ref.

2B-146. Der Gefugeaufbau der Eisenoxyd-Silikate, der Rennfeuer-u. Stuckofenschlacken und die Vorgänge bei der Ausscheidung des metallischen Eisens aus solchen Schlacken. (Structures in the Iron Oxide-Silica System, and in Direct-Process and Lump Slags; and Reactions Occurring During Precipitation of Metallic Iron From These Slags.) B. Neumann and H. Klemm. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 7-11.

Surveys the literature; the chemical character of blast-furnace slags, the FeO-Fe_2O_3-SiO_2 constitution diagram, the constituent parts of the hardened slags; and the metallurgical principles of direct-process malleable-iron production.

2B-147. Bedeutung physikochemischer Gleichgewichtsuntersuchungen fur die Erzreduktion. (Importance of Physicochemical Research on Equilibrium Conditions in Ore Reduction.) Josef Klärding. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 1-4.

As related to iron-ore reduction. The Fe-O_2-C and the C-O_2 diagrams are shown to be the basis of the reduction with solid carbon. On the basis of the study, it was found that calcining with a small amount of lime increases the amount of readily reducible iron oxide. Practical results are lower coke con-

sumption, higher capacity, and larger amount of indirect reduction in the blast furnace. It was not found possible to apply the results to magnetic roasting, carbonate roasting, or removal of arsenic from oxide iron ores. 25 ref.

2B-148. Die metallurgischen Grundlagen des Hochofenprozesses. I. Das Verhalten des Schwefels. Teil A. Zur Entschweflung des Roheisens uber gasförmiges Siliziumsulfid. (The Metallurgical Principles of Blast-Furnace Operations. I. The Effect of Sulfur. Part A. Desulfurization of Pig Iron by Forming Gaseous Silicon Sulfide.) Willy Oelsen and Helmut Maetz. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 53-58.

Investigated by adding ferrosilicon and quartz sand to sulfur-containing pig iron. Results show that more than 10% Si is required to reduce the S content to below 0.05%. 26 ref.

2B-149. Finished Steel Production: Possible Increase From Existing Equipment. R. F. Passano. *American Iron and Steel Institute,* Preprint, 1949, 23 pages.

Steel industry can produce more finished product without appreciable expansion of existing plants. Practices that decrease losses in material and time between ladle and finished hot rolled products.

2B-150. Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy and Arthur W. Thornton. *American Iron and Steel Institute,* Preprint, 1949, 21 pages.

Problem of removal of sulfur introduced by the coke. Increased amounts of slag required for increased percentages of sulfur. Results of experiments on the most effective range of slag compositions, within limits set by available materials. Effects of variations in coke sulfur and in dolomite content of slag. Substitution of dolomite for limestone improves desulfurization up to 5-8% magnesia in the slag. Ratio of sulfur in slag to sulfur in iron is shown to be a useful desulfurization index.

2B-151. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. Erle G. Hill. *American Iron and Steel Institute,* Preprint, 1949, 16 pages.

2B-152. The Chemistry of Metallurgical Slags. N. J. Grant and John Chipman. *American Iron and Steel Institute,* Preprint, 1949, 18 pages.

Includes the various methods of slag analysis, for estimation of lime-silica ratios, and for measuring basicity by means of various slag-concentrate ratios. Ionic theory of slags. 28 ref.

2B-153. Simultaneous Manufacture of Cement and Cast Iron. K. Koyanagi. *Rock Products,* v. 52, May 1949, p. 60-62.

Unusual process (the Bassett process) first introduced by a Spanish company in 1931-1935. During the war the process was tried by three large plants in Japan. Procedures and results of the latter work. 100 parts of pyrite cinder, 120-130 parts limestone, and 60-70 parts coke breeze were found to give the best results. The clinker is ground and separated by air and magnetic separators into cement and powdered iron. The latter has a composition similar to gray iron. The cement, although it contains some unseparated iron, has normal setting time and good strength.

2B-154. Desulfurizing Hot Metal. *Iron Age,* v. 163, May 12, 1949, p. 83. Based on paper by E. P. Best.

Ladle-desulfurizing method said to be the most effective means, on a commercial scale, for bringing molten metal and molten desulfurizer in contact. It is featured by a reladling operation under controlled conditions and results in a very effective association of molten metal with NaOH as the desulfurizer, making possible 90-95% sulfur removal.

2B-155. Intermittent Oxygen Enrichment of the Cupola Blast. E. N. Harrison and J. A. Wagner. *Iron Age,* v. 163, May 12, 1949, p. 96-100.

Value as a method for maintaining optimum temperature and melting rates on basis of experience of a gray-iron shop, producing thin-section castings, with 4% enrichment for 2-4 min. periods. Effect of the addition on the lining, and cost of the oxygen.

2B-156. (Book) **Seventy-Five Years of Progress in Iron and Steel; Manufacture of Coke, Pig Iron, and Steel Ingots.** C. D. King. 184 pages. 1948. American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York 18, N. Y.

Outlines history. 144 ref.

2B-157. (Book) **Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers** (v. 7, 1948). 178 pages. 1949. The Institute, 29 W. 39th St., New York 18, N. Y.

A compilation of papers and discussions presented at a conference held in Pittsburgh, Apr. 12-14, 1948. Sessions were devoted to coke and iron quality, iron-ore beneficiation, sintering-plant design and operation, and blast-furnace hearth construction. The individual papers are abstracted separately.

2B-158. Recherches sur les fours a induction a haute fréquence. (Research on the High-Frequency Induction Furnace.) H. G. Haemers and F. M. Bosch. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 367-378; discussion, p. 414-444.

Deals with slag-lining reaction in the above. Elimination of C, Si, and less than 0.02% P can be obtained without difficulty; elimination of 0.05% Mn is easy, further elimination is difficult; elimination of S is easy, provided the slag is heated.

2B-159. New "Turbo-Hearth" Steel Method Combines Bessemer and Open Hearth Processes. *Industrial Heating,* v. 16, May 1949, p. 826, 828.

Basic principles of recently developed method and equipment.

2B-160. Cold Metal Operations and Basic Foundry Practice. *Industrial Heating,* v. 16, May 1949, p. 832, 834, 836, 838, 840.

Summarizes papers and discussion on subject presented at 31st conference of National Open Hearth Steel Committee of AIME, Pittsburgh.

2B-161. A Brief History of Electric Pig-Iron Smelting in Norway. Herman Christiansen, Jr. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 11-12.

Future plans.

2B-162. The Manufacture of Electric Steel in Great Britain. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 57-78.

Data for 30 arc furnaces. Practice in one arc-furnace and in one induction-furnace shop is considered in more detail, and reference is made to the use of arc furnaces in foundries. Processes which have been used for making rimming and balanced mild steel in the electric arc furnace. Among possible future developments, mention is made of the use of oxygen.

2B-163. Operator Know-How Prolongs Electric Furnace Lining Life. John Tjemmes. *American Foundryman,* v. 15, May 1949, p. 73. A condensation.

Recommended procedures; record performance in which a superduty clay roof lasted for 657 heats.

2B-164. Improving Bessemer Steel Quality for the User. H. A. Dickie. *Sheet Metal Industries,* v. 26, May 1949, p. 956-959, 970.

Previously abstracted from *Journal of the Iron and Steel Institute.* item 2b-161, 1948.

2B-165. Some Notes on the History of Nodular Irons. *Iron Age,* v. 163, May 19, 1949, p. 100-102, 149.

An exchange of correspondence relating to the early history of the development of the nodular (or spherulitic) graphite structure between H. Morrogh, British Cast Iron Research Assn., and Oliver Smalley, president, Meehanite Metal Corp. Priority of development is contested between Meehanite Corp. and BISRA. 18 ref.

2B-166. Adding Oxygen to the Cupola Blast. *Iron Age,* v. 163, May 26, 1949, p. 65.

Running a small pipe no larger than ⅜-in. diam. to the top of each tuyere, each pipe being equipped with a small valve, is suggested as an effective method of making oxygen additions. With an arrangement of this type, the oxygen, being heavier than air, would fall into the blast stream, thus being intermixed. See abstract of article by J. Blakiston, *Foundry Trade Journal,* 2B-131, 1949.

2B-167. Die Entwicklung des basischen Windfrischverfahrens. (The Development of the Basic Converter Process.) III-V. Walter Bading. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 212-223.

Production of phosphorus double slags; rapid dephosphorization and deoxidizing reactions; production of low-nitrogen steel. Suitability of the basic converter for the large-scale production of special steels.

2B-168. Möglichkeiten zur Beeinflussung der Oxydations-zone des Hochöfens. (Possibilities of Influencing the Oxidation Zone in the Blast Furnace.) *Stahl und Eisen,* v. 66-67, Aug. 14, 1947, p. 277-284.

Results of an experimental study of the oxidation zone in which amount of blast air, blast temperature, and blast angle were systematically varied. The various distributions of O_2 and CO_2 content. Different types of high-pressure nozzles. 16 ref.

2B-169. Eisengewinnung mit hochhaltigem Sauerstoff. (Production of Iron With Highly Concentrated Oxygen.) Robert Durrer. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 239-241.

Possibility of commercial application.

2B-170. Die Manganausnutzung beim basischen Siemens-Martin-Verfahren. (The Utilization of Manganese in the Basic Openhearth Furnace.) Hans-Joachim Krabiell. *Stahl und Eisen*, v. 66-67, Dec. 4, 1947, p. 420-424.

Investigates, by mathematical methods and by evaluating of a series of melts, the factors that influence the utilization of Mn, including the effect of P in the charge. 13 ref.

2B-171. Oxygen in Iron and Steel Manufacture. L. F. Keeley. *Machinery Lloyd* (Overseas Edition), v. 21, May 21, 1949, p. 77-79.

2B-172. Factors Affecting Surface Quality. L. R. Walker. *Iron and Steel Engineer*, v. 26, May 1949, p. 58. A condensation.

Some of the problems encountered at one steelmaking plant in producing semifinished and finished material to acceptable standards of surface and internal quality. Practical solutions.

2B-173. Developments in Hot-Top Designs. E. W. Pierce. *Iron and Steel Engineer*, v. 26, May 1949, p. 69. A condensation.

Results of extensive experimental work.

2B-174. Some Aspects of Large and Small Blast Furnace Operation. G. P. Burks. *Iron and Steel Engineer*, v. 26, May 1949, p. 98. A condensation.

2B-175. "Turbo-Hearth" Steel Method Combines Benefits of Bessemer and Open Hearth. *Iron and Steel Engineer*, v. 26, May 1949, p. 108-109.

2B-176. Commercial Production of Sponge Iron. P. E. Cavanagh. *Iron Age*, v. 163, June 2, 1949, p. 67-71, 82.

Production and use in steelmaking as a substitute for scrap is shown to be commercially feasible, particularly in the making of quality steels, both in Canada and in the U. S. Test runs conducted in Sweden, employing the Wiberg-Soderfors process, show excellent performance and high production rates for Canadian Steep Rock ore. Comprehensive operating and cost data, converted to southern Ontario conditions, as well as information relating to sponge-iron end uses.

2B-177. Appraisal of Oxygen in Electric Furnace Practice. J. M. Crockett, *Steel*, v. 124, June 6, 1949, p. 126, 128, 130, 132.

Experiments indicate that there is a definite rate of oxygen injection per ton of charge, above which efficiency lessens. The rate for greatest efficiency appears to be about 100 cu. ft. per min. per ton.

2B-178. Furnace Charging; Present Methods in Open-Hearth Shops. E. L. Diamond and A. M. Frankau. *Iron and Steel*, v. 22, May 12, 1949, p. 246-254; discussion, p. 272-274.

Factors in the performance of existing systems; charging requirements; charger performance limits; supply-system limits; the layout and operation of a stage railway system; and time studies at existing works.

2B-179. O.-H. Charging Rate; The Influence of Heat Transfer. M. W. Thring. *Iron and Steel*, v. 22, May 12, 1949, p. 255-258; discussion, p. 272-274.

Previously abstracted from *Journal of the Iron and Steel Institute*, item 2B-109, 1949.

2B-180. Casting Pit Practice and Ingot Defects. R. N. Duncan. *Journal of the West of Scotland Iron and Steel Institute*, v. 55, 1947-48, p. 119-131; discussion, p. 131-140.

Previously abstracted from *Engineering*, item 2b-151, 1948.

2B-181. Periodic Operation of Electric-Arc Steel Furnaces. (In Russian.) N. V. Okorokov. *Promyshlennaya Energetika* (Industrial Power), v. 6, Jan. 1949, p. 1-4.

Attempts to establish theoretically a relationship between average melt size and dimensions and capacity of the furnace, on the one hand, and effectiveness, number of melts per operating cycle, and electric-power consumption, on the other hand.

2B-182. Neue Betriebserfahrungen bei der Herstellung stickstoffarmen Stahles durch Windfrischen. (New Experiences in the Production of Low-Nitrogen Steel in the Converter.) Walter Bading. *Stahl und Eisen*, v. 69, Mar. 31, 1949, p. 221-223.

Advantages of the oblique-blast converter, its construction, and operation. Results indicate that this converter combines advantages of the standard with those of the side-blast converter. P and N contents of steels refined by this process are less than 0.05%.

2B-183. Karburierung von Siemens-Martin-Ofen durch Gas. (Gas Carburization in Openhearth Furnaces.) Kurt Guthmann. *Stahl und Eisen*, v. 69, Mar. 31, 1949, p. 223-227.

Use of different gases in the production of steel. Proposes use of small gas generators near furnaces for production of carburizing gas to supplement coke-oven gas. Melts thus carburized can be tapped 15-

25% hotter than noncarburized melts, resulting in reduction of melting time and higher steel quality. 15 ref.

2B-184. Verhutten mit sauerstoffangereichertem Wind. (Smelting With Oxygen-Enriched Blast.) Heinrich Hellbrugge. *Stahl und Eisen*, v. 69, Apr. 14, 1949, p. 256-258.

Results of tests in a low-stack furnace. The study included high-carbon ferrochromium (28-45% Cr) and silico-chromium (47% Cr and 13% Si). The O_2 content of the blast was about 80%.

2B-185. Zusammengiessen von Thomasstahl und Elektrostahl. (Combining Basic Bessemer and Electric-Furnace Steels by Melting.) Egon Ritter. *Stahl und Eisen*, v. 69, Apr. 14, 1949, p. 258-262.

The combination of electric-furnace steel with an equal quantity of low-phosphorus or low-P and low-N steel increases production of steels equal in quality to electric-furnace or openhearth steels. Melting procedure.

2B-186. Neuere Erkenntnisse uber die Vorgänge im Konverter und ihre Bedeutung fur das Windfrischverfahren. (Recent Information on Converter Reactions and Their Significance.) *Stahl und Eisen*, v. 69, Apr. 28, 1949, p. 308-309.

Proceedings of German conference on the subject. 11 ref.

2B-187. Custo de producao do ferro gusa em forno eletrico do tiop tysland-hole, usando como redutor exclusivamente carvao de madeira. (Cost of Production of Cast Iron in an Electric Furnace of the Tysland-Hole Type Using Charcoal Exclusively as a Reducing Agent.) Ernesto L. Fonseca Costa. *Boletim da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 16-26.

Investigated on the basis of actual costs of electric energy in San Paulo. Computed data indicate that, only in case of reduction of electric energy cost by 16.7%, would the production of cast iron under the above conditions be profitable.

2B-188. A influencia de alguns fatores sobre a sinterizacao de minerios de ferro. (Influence of Certain Factors on Sintering of Iron Ores.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais*, v. 5, Jan. 1949, p. 57-67.

As applied to production of iron in blast furnaces using charcoal as the heating and reduction agent.

2B-189. Kontrola zuzla w zasadowym procesie martenowskim. (Slag Control in the Basic Open Hearth Furnace Process.) A. Ludkiewicz, E. Bucko, and S. Pniak. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 13-25.

Purposes and methods. On the basis of results obtained by observing 20 heats of steel in a 30-ton basic openhearth furnace, slag patterns were established for CaO-SiO_2 ratios of 1.2-4.79 for various contents of FeO. Control by means of slag pancakes offers no difficulties.

2B-190. (Book) **Les Laitiers Métallurgiques et Leurs Réactions.** (Metallurgical Slags and Their Reactions.) E. Eyt. 94 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France. 960 fr.

Chemical constitution of slags and of slag-metal reactions. The information presented is believed to be of value to glass and ceramics technologists and cement makers, as well as to metallurgists and steelmakers.

2B-191. Improved Steelmaking Techniques. Ralph W. Farley, *Metal Progress*, v. 55, June 1949, p. 834-837, 878, 880.

Proceedings of 32nd annual meeting of National Openhearth Steel Committee of AIME held in Chicago in April. Description of Gary Works of Carnegie-Illinois Steel Corp., which was visited.

2B-192. Belgian Research on Nodular Cast Iron. A. L. DeSy. *Metal Progress*, v. 55, June 1949, p. 838.

Includes a study of the systematic production of nodular cast irons and their malleablizing, and a theoretical inquiry into the formation of nodules. As-cast and annealed structures.

2B-193. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. Erle G. Hill. *Blast Furnace and Steel Plant*, v. 37, June 1949, p. 667-672.

Previously listed from *American Iron and Steel Institute*, item 2B-151, 1949.

2B-194. Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy and Arthur W. Thornton. *Blast Furnace and Steel Plant*, v. 37, June 1949, p. 676-686.

Previously abstracted from *American Iron and Steel Institute*, item 2B-150, 1949.

2B-195. Further Notes by Morrogh on Nodular Cast Iron. H. Morrogh. *Iron Age*, v. 163, June 16, 1949, p. 64, 66, 68.

Lengthy "Letter to the Editor" attempts further refutation of Smalley's reply to a previous letter on the subject of priority with respect to development of nodular cast iron. (See "Some Notes on the History of Nodular Irons," May 19 issue.)

2B-196. The Electric Smelting of Iron Ores for Production of Alloy Irons and Steels and Recovery of Chromium and Vanadium. William Bleloch. *Journal of the Chemical, Metallurgical & Mining Society of South Africa*, v. 49, Mar. 1949, p. 363-402; discussion, p. 403-408.

Fundamental data on reduction of iron oxides; mechanism and velocity of their reduction; industrial electric pig-iron furnaces; metallurgical considerations; ores, fluxes, and coals suitable for electric smelting; burdening for electric smelting; and ore crushing and stock-yard equipment. A typical plant and economics of steam and gas turbines. Capital and production cost data; future trends; and electric smelting of ilmenite. 29 ref.

2B-197. Die Umsetzungen titanoxydhaltiger Kalksilikatschlacken mit kohlenstoffhaltigem Eisen als Grundlage zur Verhuttung titanhaltiger Eisenerze. (The Reactions of Lime Silica Slags With Carbonaceous Iron as a Basis for Smelting Titanium-Containing Iron Ores.) Hanns Wentrup, Helmut Maetz, and Paul Heller. *Archiv fur das Eisenhuttenwesen*, v. 20, Mar.-Apr. 1949, p. 139-150.

Experiments were made to establish optimum operating conditions for the above smelting process and to determine the conditions under which the undesirable liquation of titanium carbide from the pig-iron melt can be avoided. Correlates the reduction of Ti and Si with several smelting factors. Titanic acid has only a moderate effect on the desulfurization of pig iron with calcium silicate slag. 28 ref.

2B-198. Bau und Betrieb der Krupp-Rennanlage in Watenstedt. (Design and Operation of the Krupp Direct-Process Iron-Ore Reduction Plant in Watenstedt.) Dietrich Fastje. *Stahl und Eisen*, v. 69, May 12, 1949, p. 319-325.

Flow of material and arrangement of equipment. Technical and economic advantages. Plant description. 15 ref.

2B-199. Alloys and the Steel Industry. T. W. Merrill. *Iron and Steel Engineer*, v. 26, June 1949, p. 100-106; discussion, p. 107.

Uses, both as an aid in refining, and for improvement in final physical properties.

2B-200. More and Better Alloy Steels Produced by Use of Oxygen in Basic Electric Furnaces. *Industrial Heating*, v. 16, June 1949, p. 1015-1016. Condensed from paper by John E. Harrod.

Experiences at South Works, Carnegie-Illinois Steel Corp., Chicago.

2B-201. Some Aspects of Large and Small Blast Furnace Operations. G. P. Burks. *Industrial Heating*, v. 16, June 1949, p. 1018, 1020. A condensation.

The primary conclusion reached from this comparison of operations at Gary Works is that the iron production rate per unit of hearth area of large furnaces will approach that of small furnaces when high-grade raw materials are available for both. Conversely, as raw-material quality deteriorates, the small furnaces can be expected to maintain a proportionately higher iron production rate than the large ones.

2B-202. Gregg Comments on the Turbo Hearth. A. W. Gregg. *Iron Age*, v. 163, June 23, 1949, p. 46, 48, 50.

Discusses article by E. C. Bain and H. W. Graham on "The Turbo Hearth" (Apr. 21 issue.) This furnace is actually a side-blow or Tropenas converter. Cites article by Sims and Dahle (1942) showing that side-blown converter steel is as good as openhearth or electric-furnace steel in almost all respects. Use of oxygen-enriched blast in side-blow operation, outlining some recent experimental result. Six advantages of the side-blow over the bessemer converter.

2B-203. Oxygen Enrichment in the Low-Shaft Furnace. *Iron Age*, v. 163, June 23, 1949, p. 70. Condensed from *Iron and Coal Trades Review*, May 20, 1949.

Recent investigations in Trostberg, Bavaria, have shown that, in a small low-shaft furnace, a basic pig iron of normal analysis can be produced without difficulty, using an oxygen-enriched blast. A high-carbon ferrochrome has also been produced with an 80% oxygen blast.

2B-204. Nitrogen in Steel. Simon Feigenbaum and George H. Enzian. *Iron Age*, v. 163, June 30, 1949, p. 52-54.

Current research trends embracing control and analytical techniques. Investigations of the isolation and identification of nitrogen compounds. 14 ref.

2B-205. Sulphur Control and Manganese Conservation in Open Hearth

Furnaces. Donald E. Babcock. *American Iron and Steel Institute,* Preprint, 1949, 62 pages.

Includes the combined blast furnace and openhearth operating problems, and the general solution of the problem. 38 ref.

2B-206. Die Flammenstrahlung des basischen Konverters. (Flame Radiation in the Basic Converter.) Gerhard Naeser and Werner Pepperhoff. *Stahl und Eisen,* v. 69, June 9, 1949, p. 391-398.

Glaser's spectral-analytical observations of the bessemer flame showed the possibility of terminating the melting process at any desired carbon content on the basis of the disappearing spectrum lines of luminous Mn vapors. Results of a study of this possibility and of the energy distribution in the total visible and infrared spectrum as a function of melting time. 11 ref.

2B-207. Zur Viskosität von Hochofenschlacken. (The Viscosity of Blast Furnace Slag.) Gerhard Behrendt and Theo Kootz. *Stahl und Eisen,* v. 69, June 9, 1949, p. 399-403.

Use of a new and simple viscosimeter. Viscosity of various regions of common slag systems is shown graphically and certain recommendations are made for controlling viscosity of slag by regulating its composition. 15 ref.

2B-208. La décarburation au four a arc basique. (Decarburization in a Basic Electric Arc Furnace.) M. Archard. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 6, Feb. 1949, p. 71-82.

Establishment of optimum conditions for decarburization consisted mainly in elimination of carbon content above 0.3%; establishing the rate of decarburization below 0.005% carbon per min.; and termination of decarburization before carbon content decreases below 0.1%.

2B-209. Blast Furnace Practice at Fontana. C. H. Lenhart. *Iron and Steel Engineer,* v. 26, July 1949, p. 35-43; discussion, p. 43-46.

Unusually good operating results are obtained, in spite of inferior and non-uniform raw materials, due to care taken in preparing the raw materials. Coke, ore beneficiation, limestone, and burdening of the furnace.

2B-210. Mangans inverkan pa de metallurgiska reaktionerna vid den basiska martinprocessen. (The Influence of Manganese Upon the Metallurgical Reactions in the Basic Open Hearth Process.) Sven Fornander. *Jernkontorets Annaler,* v. 133, no. 5, 1949, p. 163-190.

Thirty-six experimental heats were made at four different steelworks. A new method was developed for taking bath samples for oxygen determinations. The Mn content, which was varied between 0.15 and 2.3%, has no influence upon the oxygen content of the bath nor upon the rate of carbon drop. The carbon content was the factor having the greatest influence on the oxygen content during the refining period. The results do not indicate whether or not a high Mn content is beneficial. 23 ref.

2B-211. Proper Sizing, Screening and Preparation of Blast Furnace Coke. D. P. Cromwell and C. A. Covington. "Yearbook of the American Iron and Steel Institute, 1948", p. 162-179; discussion, p. 180-188.

Practice at Campbell Coke Works of Youngstown Sheet & Tube Co. Emphasizes necessity for rigid control of above procedures.

2B-212. Effect of Coke Quality on Blast Furnace Iron Tonnage. E. J. Gardner. "Yearbook of the American Iron and Steel Institute, 1948", p. 189-201; discussion, p. 202-211.

Previously abstracted from *Blast Furnace and Steel Plant,* item 2b-126, 1948.

2B-213. Tonnage Oxygen for Increased Iron and Steel Production. J. H. Strassburger. "Yearbook of the American Iron and Steel Institute, 1948", p. 214-249; discussion, p. 250-259.

Previously abstracted from *Steel,* item 2b-184, 1948.

2B-214. Some Practical Aspects of Direct Oxidation in the Basic Open Hearth Process. Frank G. Norris and Edward B. Hughes. "Yearbook of the American Iron and Steel Institute, 1948", p. 260-280; discussion, p. 281-286.

On the basis of study of two series of heats with special attention to refining practice.

2B-215. Use of Oxygen for Decarburization and Melting in Electric Furnaces. J. H. Eisaman. "Yearbook of the American Iron and Steel Institute, 1948", p. 287-296; discussion, p. 296-298.

Previously abstracted from *American Iron and Steel Institute,* preprint, item 2B-128, 1948.

2B-216. Experience to Date on Iron Production by Methods Other Than Coke Blast Furnace; Direct Reduction. Earle C. Smith. "Yearbook of the American Iron and Steel Institute, 1948", p. 302-342; discussion, p. 343-345.

Especially sponge-iron methods, giving history and present status of methods and equipment used in China, Sweden, Africa, and other parts of the world. 25 ref.

2B-217. Factors Affecting Surface Quality of Steel Products. L. R. Walker. *Industrial Heating,* v. 16, July 1949, p. 1216, 1218.

Effect of higher soaking temperature, increased soaking time, increased nozzle size, increased holding time after teeming and coating of new molds are evaluated as to surface and internal defects.

2B-218. Nodular Iron—The Patent Situation. Oliver Smalley. *Iron Age,* v. 164, July 14, 1949, p. 68, 72.

Another "Letter to the Editor" continues the controversy between Smalley of Meehanite Metal Corp. and Morrogh of British Cast Iron Research Assoc. regarding priority in development of nodular iron. (See May 19 and June 16 issues.)

2B-219. Reducing Coke Consumption in Iron and Steel Production. Magnus Tigerschiold. *Iron Age,* v. 164, July 14, 1949, p. 84-91.

Swedish accomplishments with respect and previously unpublished Swedish data. The roles of beneficiating, sintering, high top pressures, oxygen-enriched blast, electric smelting, and sponge iron. 29 ref.

2B-220. Expansion Program Increases Capacity at Bethlehem's Sparrows Point Plant. *Steel,* v. 125, July 18, 1949, p. 102, 104, 107, 122.

Expansion of facilities in the coke, blast furnace, and openhearth departments together with many newly installed and revamped rolling units.

2B-221. Adsorption Phenomena on the Surface of Molten Steel. (In Russian.) B. V. Stark and S. I. Filippov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences) Mar. 1949, p. 413-420.

Studied in order to establish the basic laws of adsorption of carbon and oxygen dissolved in iron and the possible effects of these surface phenomena on decarburization. Method of investigation. The importance of surface phenomena during steel refining.

2B-222. Contribution a l'étude de l'utilisation des Cowpers dans la sidérurgie. (Contribution to the Study of the Use of Cowpers Stoves in Ferrous Metallurgy). M. G. Namy. *Circulaire d'Informations Techniques,* v. 6, Mar. 1949, p. 121-140.

Results of an extensive theoretical and experimental investigation of the above, used to heat the air for blast furnaces. Factors influencing efficiency. Optimum conditions of operation and different types of equipment. Equations for calculation of various steps of the operation.

2B-223. The Effects of Zirconium in Cast Iron. C. M. Offenhauer and J. F. Collins. *Canadian Mining and Metallurgical Bulletin,* v. 42, July 1949, (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), p. 338-348; discussion p. 348-350.

The literature and results of experiments. Zirconium markedly affects the formation of graphite in cast iron according to the composition of the iron and the amount of the zirconium addition. Usually, it is employed in the form of a complex addition agent in order to facilitate its introduction and to guide its effects. 25 ref.

2B-224. Cupola Charge Materials. Report and Recommendations of Sub-Committee T. S. 27 of the Technical Council. *Foundry Trade Journal,* v. 87, July 7, 1949, p. 19-25; July 14, 1949, p. 45-51; July 21, 1949, p. 81-86; July 28, 1949, p. 119-124.

Metallics, fuels, and fluxes are considered in that order in the first three installments. Variations of composition, physical condition, etc., and recommends methods of combating adverse effects. Techniques for making the best use of nonideal materials. The final installment contains tables dealing with charge calculation and also a selected bibliography. 75 ref.

2B-225. Making Steel from Argentine High-Phos Pig Iron. E. J. Ash. *Steel,* v. 125, Aug. 8, 1949, p. 78, 81.

Experimental heats made at an Ohio electric-furnace shop using an all-pig charge demonstrate the feasibility of the practice on a commercial scale in Argentina.

2B-226. (Book) Progress in Steelmaking. 106 pages. Steel Magazine, Penton Bldg., Cleveland 13, Ohio. $3.00.

A collection of 32 articles apparently reproduced from various issues of *Steel* published during the past few years. Miscellaneous topics concerning the process itself and auxiliary subjects such as coal washing, ore beneficiation, refractories, furnaces, handling equipment, analyses, temperature measurement, lubricants, pickling, tinning, rolling.

2B-227. Another Look at the Problem of Steel Deoxidation. John Chipman. *Metal Progress,* v. 56, Aug. 1949, p. 211-221.

Many discrepancies between the results of experiments and thermodynamic computations can be ascribed to the ability of an alloying element to share electrons with oxygen, as do the surrounding iron atoms, thus tying up the oxygen and reducing its activity. These relationships are shown quantitatively for the common alloying elements in steel. 16 ref.

2B-228. Chromium-Oxygen Relations in Liquid Steel. John Chipman. *Metal Progress,* v. 56, Aug. 1949, p. 216B.

Shown by means of several graphs.

2B-229. Sulphur in Basic Iron and Steel. H. E. Warren, Jr. *Journal of Metals,* v. 1, sec. 1, Aug. 1949, p. 6-8; discussion p. 8-10.

Disposition of sulfur in iron and factors which affect sulfur in steel. Data were taken from 24 casts from blast furnaces which were arbitrarily operated to produce high-sulfur iron. No relationship was found between sulfur in the iron and the melt and ladle sulfurs.

2B-230. Equilibrium in the Reaction of Hydrogen With Oxygen in Liquid Iron. Minu N. Dastur. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 441-445.

An experimental study. Errors of thermal diffusion in the gas mixture were eliminated by preheating the entering gas stream to the temperature of the metal. A further safeguard was admixture of pure argon in a ratio of about 4 to 1. 14 ref.

2B-231. Deoxidation of White Cast Iron—An Interpretation Applied to Malleable Irons. Richard W. Heine. *Foundry,* v. 77, Aug. 1949, p. 74-78, 229-230.

Some phases of the effects of oxygen as revealed by deoxidizing treatments applied to white cast irons. Deoxidizing additions of aluminum, 40% ferrotitanium, a special 40% Zr alloy, or hydrogen were made. Test pieces from each heat were given an annealing treatment to show the effects of the deoxidation treatments on first-stage graphitization. A relationship was found between the extent of deoxidation and some basic fundamentals of the graphitizing process. (To be concluded.)

2B-232. Distribution of Oxygen Between Molten Iron and Iron Oxide-Silica Slags. Gerhard Derge. *Industrial Heating,* v. 16, Aug. 1949, p. 1396, 1398, 1400, 1402, 1404, 1436.

Use of a rotating induction furnace with a heavy-walled, fused-silica crucible and an iron liner at the slag line, for studying reactions between molten iron and slags of the iron-oxide-silica system which are not saturated with silica. Various heats were analyzed for oxygen and silicon contents. Graphs give % O_2 in the metal plotted vs. % S in the metal and % FeO in the slag. New information on the molecular constitution of iron silicate slags is derived from the data.

2B-233. The CaO-MgO-Cr_2O_3 Ternary System. Part II. Further Experiments. W. J. Ford and W. J. Rees. *Transactions of the British Ceramic Society,* v. 48, Aug. 1949, p. 291-321.

Some properties of the three compounds obtainable on heating mixtures of lime and chromic oxide in air. X-ray study of the dissociation of $CaCr_2O_4$ in vacuum gave evidence for the constitutions of the complex compounds formed in air below the temperature at which liquid is produced. Phase distribution was determined in air at various temperatures, and in vacuum. Application of the diagram to the working of high Cr steels. Appendix by J. White consists of a theoretical interpretation of the experimental data on the above system.

2B-234. Pig Iron From Iron and Steel Swarf. *Iron Age,* v. 164, Aug. 18, 1949, p. 104. Based on article in *Iron & Coal Trades Review,* July 8, 1949.

Results obtained with a 30 to 40-ton per day blast furnace in Hungary.

2B-235. Experiments on the Gas and Fluid Flow in a Side-Blown Converter Model. M. P. Newby. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 452-456.

In order to throw light on the movements of metal, slag, and blast, experiments were carried out on a small-scale model at room temperature. Existence of a back eddy filling a large portion of the chamber was demonstrated, and it is thought that the heavy wear on the lining, which occurs on the back wall above the tuyeres, may be associated with a recirculating stream of hot gas which strikes the wall in this region.

2B-236. Observations at the Stockline in a Driving Blast-Furnace. A Technique for Determination of Contour, Movement, and Gas Composition. E. W. Voice. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 450-451.

Apparatus and typical results. Determination of temperatures is also believed possible.

2B-237. Bessemer Steelmaking. Comprehensive Report of the B.I.S.R.A. Sub-Committee. *Iron and Steel,* v. 22, July 1949, p. 354-358; Aug. 1949, p. 377-382, 384.

Various processes and possible combinations. Uses of bessemer steel

and possible lines of research. Aug. installment: American practice and suggestions for future developments, including oxygen enrichment.

2B-238. Teeming Practice; Overcoming Difficulties in the Production of Good Ingots. N. H. Bacon. *Iron and Steel,* v. 22, Aug. 1949, p. 372-376.

Practical problems. (To be concluded.)

2B-239. Addition of Steam to Blast Furnace. *Metal Progress,* v. 56, Aug. 1949, p. 234, 236. Translated and condensed from "Catalysts for the Reduction Process in Blast Furnaces," M. I. Korobova and N. I. Korobov, *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), 1946, p. 567-577.

Value of hydrogen as a "catalyst" for the reduction of FeO. Experience with addition of steam to the blast, from which H_2 is produced inside the furnace by reduction with CO or C. Contrary to American experiences, the furnaces ran more evenly and coke consumption per ton of iron was decreased.

2B-240. Vyroba ocele pri zvysenych vsazkach suroveho zeleza. (Steel Production With High Pig-Iron Charges.) Alois Emil Dobner. *Hutnické Listy,* v. 4, May 1949, p. 133-139.

An openhearth process using 60% pig-iron is based on the Monell and Bertrand-Thiel processes, which use up to 80% pig iron. The method involves a time separation of ore and lime boils and almost complete exclusion of Si and P from the slag.

2B-241. Karburierungsversuche mit Steinkohlenstaub im koksofengasbeheizten Siemens-Martin-Ofen. (Carburizing Tests With Anthracite Coal Dust in an Openhearth Furnace Heated by Coke-Oven Gas.) Ernst Meier-Cortes. *Stahl und Eisen,* v. 69, July 7, 1949, p. 476-480.

Equipment and procedures for carburizing steels with anthracite.

2B-242. Berechnungsverfahren zur Ueberprüfung von Fehlerquellen in den Betriebsergebnissen von Hochöfen. (Calculation Methods for Control of Sources of Error in Blast Furnace Operation.) Fritz Wesemann and Karl Kessels. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 211-218.

Develops, by means of materials balances, a method of controlling blast furnace operations and a uniform but simple method for computing important operating data. A chart shows the gravity and composition of the throat gases.

2B-243. Oxygen in Steel Producing Furnaces. G. D. Stone. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 56-57; discussion, p. 58.

Some general conclusions drawn from thousands of heats made under a wide variety of conditions. Some of the apparatus evolved from this experience. Indicates that it may be more economical to use smaller flows and quantities than that used in the earlier development work.

2B-244. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. Erle G. Hill. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 85-89. A condensation.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 2B-151, 1949.

2B-245. Finished Steel Production—Possible Increase From Existing Equipment. R. F. Passano. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 92-96. A condensation.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 2B-149, 1949.

2B-246. Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 96-97. A condensation.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 2B-150, 1949.

2B-247. Sulphur Control and Manganese Conservation in Open Hearth Furnaces. D. E. Babcock. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 97-98. A condensation.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 2B-205, 1949.

2B-248. Economic and Safety Advantages Seen for Improved Nodulizing Alloy. E. T. Myskowski and R. P. Dunphy. *Steel,* v. 125, Sept. 5, 1949, p. 82-83, 114, 116.

New Fe-Si-Mg alloy just announced by Naval Research Laboratory in Washington contains approximately 8% Mg in a 50% ferrosilicon carrier. Show nodulizing effects on the graphite and tensile strengths. Cost advantages and elimination of processing hazards.

2B-249. A Graphite Nodulizing Alloy. E. T. Myskowski and R. P. Dunphy. *Iron Age,* v. 164, Sept. 8. 1949, p. 78-79.

See preceding abstract (item 2B-248).

2B-250. Deoxidation of White Cast Iron. (Concluded.) Richard W. Heine. *Foundry,* v. 77, Sept. 1949, p. 84-85, 239-243.

Practical application and interpretation of principles dealt with in

Aug. issue. Use of deoxidizers and relative deoxidizing properties of various elements.

2B-251. Nodular Graphite Cast Iron. C. K. Donoho. *Pig Iron Rough Notes,* v. 109, Summer 1949, p. 3-7.

Produced by use of several Mg alloys.

2B-252. Blast-Furnace Control Via the Tuyeres. Tom Bishop. *Metal Progress,* v. 56, Sept. 1949, p. 359-360.

Introduction of lime through the tuyeres has proven practical in preliminary tests. Possibility of extension to powdered ore, fuel, and high-pressure air or oxygen, by use of suitably designed tuyeres.

2B-253. High-Cr Steel in Acid Arc Furnace. D. C. Hilty. *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 20-23.

Chromium and carbon content and bath temperature at the end of the oxygen blow show that the equilibrium relationships previously shown for basic arc furnaces are also true in acid arc furnaces. One of three trial heats in which Al was fed to the oxidized slag indicated an increase in recovery of Cr from scrap charged. One heat, purposely melted in at higher carbon than usual, gave an indication of possible time saving. Ferrosilicon and lime were ineffective in reducing Cr from the acid slag.

2B-254. "15-Minute Pig Iron". *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 24.

Process recently announced is now on a pilot-plant scale of 500 lb. per hr. Operation is automatic from crushed iron to briquettes, through a preheating oven and an electric furnace. Possible disadvantages.

2B-255. Report on the Bessemer Process. *Iron and Steel Institute* (London), Special Report No. 42, May 1949, 80 pages.

Part 1: British practice, with sections on basic, acid, surface-blown converter, and multiplexing processes. Part 2: foreign practice, with sections on Swedish, German, and American practice. Part 3: possible future developments. Appendices describe several British plants, list of plants in Britain and abroad, and references (with abstracts) to recent literature (1947 to date).

2B-256. Wiberg-Soderfors Method for the Manufacture of Sponge Iron. Bo Kalling and John Stalhed. *Steel,* v. 125, Sept. 19, 1949, p. 72-75, 102, 104, 106.

Procedure followed by a Swedish company. The reduction agent is almost completely utilized for reducing and heating the ore. Energy is supplied by combustion of some of the fuel by oxygen gas or oxygen-enriched air, thus obviating use of electric energy.

2B-257. Pilot-Plant Production of Steel From Sponge Iron. W. W. Stephens and J. L. Morning. *U. S. Bureau of Mines, Report of Investigations* 4498, Aug. 1949, 21 pages.

Tests in which several different types of sponge iron were used as charge material for production of steel in a 4-ton basic arc furnace. Equations for calculating the amount of reducing agent required to complete reduction of iron oxide and provide carbon in the bath at meltdown, weight of slag formed in melting sponge iron of a given analysis, and the increased power requirement for production of steel from sponge iron. Cost analysis.

2B-258. Induction Stirring in Electric Furnace Steelmaking. E. S. Kopecki. *Iron Age,* v. 164, Sept. 22, 1949, p. 73-78.

Economic, metallurgical, and operational advantages are said to result from agitation of arc furnace heats by induction stirring. Constructional features of an induction stirrer; results of its use in extensive steelmaking tests in Sweden. Production increase of 20% is reported.

2B-259. A Statistical Analysis of the Output of an Open-Hearth Furnace. F. L. Robertson and M. W. Thring. *Journal of the Iron and Steel Institute,* v. 163, Sept. 1949, p. 31-50.

Measurements of nearly all the important variables which might affect output were made on about 47 casts from a single furnace. The measurements were analyzed to determine those which are clearly related.

2B-260. Distribution of Materials in the Blast-Furnace. Part II. Compensated Charging. H. L. Saunders and R. Wild. *Journal of the Iron and Steel Institute,* v. 163, Sept. 1949, p. 61-70.

Extension of the work on the distribution of materials in the blast furnace by comparing the results obtained in the laboratory with those on a scale intermediate between the latter and full-size furnaces. Comparative results show the reliability of the models as predictors, the necessity for some scheme of compensated charging to eliminate segregation, and application of a scheme worked out in the laboratory to an experimental blast furnace.

2B-261. Teeming Practice; Overcoming Difficulties in the Production of Good

Ingots. N. H. Bacon. *Iron and Steel,* v. 22, Sept. 1949, p. 417-421.

Tundish teeming and bottom pouring as alternatives to direct teeming. Includes calculations, diagrams, and tables.

2B-262. German Ferrous Metal Industry; B.I.O.S. Overall Report, No. 15. *Iron and Steel,* v. 22, Sept. 1949, p. 422-424.

Condensed version of report. Includes information on ores and ore preparation.

2B-263. Production of Pig Iron. Part I, II, III, IV. B. M. Stubblefield. *Steel,* v. 125, Sept. 12, 1949, p. 128, 130, 133, 136, 138, 140, 143; Sept. 19, 1949, p. 88, 91-92, 94, 97-98; Sept. 26, 1949, p. 78, 80, 83-84, 86, 88; Oct. 3, 1949, p. 84, 87-88, 90, 92, 94.

Part I: increase in production during the last half-century affected by improvements and refinements in auxiliary equipment, improved raw-material preparation and selection, and more intelligent handling of furnace operations. Part II: effects of fuel availability on location of iron and steel production. Description of byproduct ovens and blast furnaces. Part III: importance of correct refractories and auxiliary equipment. Part IV: the cast house, charging of raw materials, chemistry of furnace reactions, and modern trends in blast furnace construction and operating practice. 13 ref.

2B-264. Magnesium Additions and Desulphurization of Cast Irons. J. E. Rehder.. *American Foundryman,* v. 16, Sept. 1949, p. 33-37.

Experimental work by the Canadian Bureau of Mines. Literature data on recovery of magnesium from different addition agents are of little specific use except as rough indications of efficiency, since the desulfurizing effect has not been distinguished from the residual amounts of Mg retained. If these effects are considered, and if residual S content after Mg treatment is assumed to withhold Mg from effective nucleation action in forming nodular graphite, a quantity called "nucleating Mg" is found to give good correlation in the metallurgy of Mg-treated cast iron.

2B-265. Electric Iron-Ore Smelting. Mohammed A. Kassem. *Metallurgia,* v. 40, July 1949, p. 145-149.

Early furnaces and the modern low-stack furnace; advantages and cost. Utilization of gas products in cement manufacture and for direct reduction.

2B-266. The Bessemer Process; Some Aspects Arising From a Study of Practice. *Metallurgia,* v. 40, July 1949, p. 150-154.

Report by a subcommittee, appointed by the British Iron and Steel Research Association, which has been investigating the possibilities of increased uses for bessemer steel.

2B-267. Steel-Making for Castings. E. C. Pigott. *Metallurgia,* v. 40, July 1949, p. 155-158; Aug. 1949, p. 190-193.

Processes for producing steel suitable for castings are bessemer, acid bessemer, Tropenas, electric arc, basic acid electric induction, basic openhearth, and acid openhearth. Choice of process for best balance of cost and quality.

2B-268. Nodulizing Gray Iron With Dilute Magnesium Alloy. *Iron Age,* v. 164, Sept. 29, 1949, p. 65.

Use of Mg alloy which contains 7% Mg, 45% Si, remainder Fe. Hazards of Mg addition are minimized and it may be employed without extensive modification of existing foundry practices. The alloy acts as an inoculating as well as a nodulizing agent. Another nodulizing agent showing promise is a briquetted mixture of Mg and Si-Zr.

2B-269. Desulphurization in the Basic Open Hearth Furnace Using Bauxite. Leslie Cook. *Blast Furnace and Steel Plant,* v. 37, Sept. 1949, p. 1067-1068.

Practice at Brazilian plant. Concludes that bauxite may be usefully employed in moderate quantities as a flux without hindering the rate of desulfurization.

2B-270. Kinetics of Ingot Solidification. (In Russian.) V. M. Breitman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 21, 1949, p. 385-388.

Proposes simple equations for the solidification of cylindrical and spherical ingots. Use of these equations indicates the moment of complete solidification, the rate of solidification, and the thickness of the solidified surface "crust" at a given time. Equation is solved for "ideal" materials and conditions; in practical application, it is necessary to introduce a coefficient depending on the physical and chemical properties of the particular material. Results of experiments on paraffin and steel confirm the validity of the equation.

2B-271. Electric Furnace Melting. W. O. Igelman and F. S. Nussbaum. *Metal Progress,* v. 56, Oct. 1949, p. 483-485.

Application of quality control methods to new equipment and

processes at National Malleable & Steel Castings Co.

2B-272. Alloy Recovery. Charles R. Funk. *Metal Progress,* v. 56, Oct. 1949, p. 486-487.

Procedure for recovering Cr from steel scrap or ore in the basic open-hearth.

2B-273. Graphite Stool Inserts for Big-End-Down Molds. W. Earle Black. *Iron and Steel Engineer,* v. 26, Sept. 1949, p. 140-142.

Results of tests of carbon and graphite inserts in mold stools begun by Jones & Laughlin Steel Corp. in June 1944. It was found that inserts increase stool life and practically eliminate stool stickers.

2B-274. Quality of Oxygen-Decarbonized Acid Electric Steel. Charles A. Faist and Clyde Wyman. *Journal of Metals* (News Section), v. 1, Oct. 1949, p. 18-27.

Variables comprising acid electric practice as they influence quality and economics.

2B-275. Improvement of Machinability in High Phosphorus Gray Cast Iron. William W. Austin, Jr. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 431-444; discussion, p. 444-445.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-21. See item 2b-79, 1948.

2B-276. New Methods of Ladle De-Sulphurising Pig Iron. W. C. Newell, A. J. Langner, and J. W. Parsons. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A166-A170; discussion, p. A170-A172.

Previously abstracted from *Foundry Trade Journal.* See item 2b-153, 1948.

2B-277. Research and Quality in the Steel Industry. Charles M. Parker. *Iron Age,* v. 164, Oct. 6, 1949, p. 99-104.

Various phases of steelmaking are explored from the standpoint of existing problems and research done to overcome the difficulties. Instrumentation and mechanization developments. Coal cleaning, ore sintering and agglomeration, removal of sulfur from raw materials, new refractories, use of oxygen, and other developments.

2B-278. Über das Erschmelzen von Roheisen im Kokshochofen und dessen Entschwefelung mittels Soda. (Melting of Pig Iron in the Coke Blast Furnace and Its Desulfurization by Means of Soda.) Karl Suresch. *Chemische Technik,* v. 1, July 1949, p. 23-27.

Acid smelting, the conversion to basic melting, and a modern method of desulfurization of pig iron outside the blast furnace by blowing soda against the flowing melt. 17 ref.

2B-279. (Book) **Some Fundamental Problems in the Manufacture of Steel by the Acid Open Hearth and the Acid Electric Processes.** *Acid Open Hearth Research Association,* Bulletin No. 2, 72 pages. Acid Open Hearth Research Association, P. O. Box 1873, Pittsburgh. $1.00.

Introductory statement plus the following reprinted papers (all previously abstracted): "Some Fundamental Problems in the Manufacture of Steel by the Acid Open Hearth Process", G. R. Fitterer, *Transactions of the American Society for Metals,* v. 34, 1945, p. 1-30; "Acid Electric Slags", G. R. Fitterer, *Electric Furnace Steel Proceedings* (AIME), v. 4, 1946, p. 185-198; "Control of Acid Open Hearth Heats Through Measurements of Slag Fluidity", James W. Linhart, *Open Hearth Proceedings* (AIME), v. 29, 1946, p. 299-308; "A Comparison of the Pt-PtRh Thermocouple With the Optical Pyrometer for Temperature Measurements in Liquid Steel", G. R. Fitterer and J. W. Linhart, *Open Hearth Proceedings* (AIME), v. 30, 1947, p. 289-297; and "The Relation of Acid Open-Hearth Furnace Efficiency to Practice", G. R. Fitterer, J. G. Bassett, and J. B. Kopec, *Open Hearth Proceedings* (AIME), v. 31, 1948, p. 307-317.

2B-280. Concentrated Oxygen in Open Hearth Furnaces. W. Trinks. *Industrial Heating,* v. 16, Oct. 1949, p. 1738, 1740.

Advantages and disadvantages. Need for cut-back of oxygen feed in the latter part of the heat to prevent serious refractory damage.

2B-281. World's Largest Open Hearth Is Completed by Weirton Steel. *Iron and Steel Engineer,* v. 26, Oct. 1949, p. 89.

Dimensional data.

2B-282. Factors Affecting Open Hearth Production. C. L. Altenberger. *Iron and Steel Engineer,* v. 26, Oct. 1949, p. 96-98; discussion, p. 98.

2B-283. The Effect of Sodium Oxide Additions to Steelmaking Slags. Part I. Use of Soda to Dephosphorize Pig Iron at 1400° C. W. R. Maddocks and E. T. Turkdogan. *Journal of the Iron and Steel Institute,* v. 162, July 1949, p. 249-264.

Soda was added to basic and acid slags with the object of bringing about dephosphorization at low temperatures. In basic slags it was found impossible to retain soda as a sili-

cate, which is necessary for formation of sodium phosphate. With slags containing up to 50% silica and a low CaO-SiO_2 ratio, dephosphorization took place after melting on acid hearths. Under favorable conditions as much as 85% dephosphorization of a 1.34% phosphorus iron was achieved.

2B-284. Investigations on an Experimental Blast-Furnace. H. L. Saunders, G. B. Butler, and J. M. Tweedy. *Journal of the Iron and Steel Institute*, v. 163, Oct. 1949, p. 173-206.

General layout and design of tuyeres, blast heater, sampling probes, and compensated charging mechanism. Main object of the work was to determine the manner in which temperature and CO_2 distribution in the stack are influenced by changing the segregation of the ingoing materials. Experimental data are interpreted in relation to the blast-furnace process.

2B-285. Pressure Operation; Modern Trends in Blast Furnace Practice. J. M. Ridgion. *Iron and Steel*, v. 22, Oct. 1949, p. 443-447.

Results of American work as disclosed by published literature and personal inquiry. 18 ref.

2B-286. Steel Production; A Summary of German Wartime Practice. *Iron and Steel*, v. 22, Oct. 1949, p. 463-465. Condensed from Section 11, BIOS Overall Report No. 15, "German Ferrous Metal Industry".

Basic bessemer, openhearth and electric steel practice in Germany during the war; differences between German and British or American practice. Wartime expedients to overcome shortages of materials and equipment.

2B-287. Fer électrolytique. (Electrolytic Iron.) Ch. Tschäppät. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Aug. 1949, p. 225-242.

Principles of direct electrolytic manufacture of 0.05-0.3 mm. sheets, eliminating melting and rolling operations. This material is especially valuable in manufacture of electrical machinery. Commercial method. Electrical, chemical, and mechanical properties. 26 ref.

2B-288. Su alcune osservazioni statistiche circa il tenore d'assigeno durante l'affinazione dell' acciaio. (Statistical Data Concerning the Amount of Oxygen Used During Refining of Steel.) Adolfo Antionioli. *La Metallurgia Italiana*, v. 41, Mar.-Apr. 1949, p. 71-79.

Statistical analysis and correlation of data from the literature, based on two assumptions concerning the mechanism of the action of carbon during steelmaking. Influence of different factors.

2B-289. Influenza del minerale agglomerato nella carica dell' alto forno. (Influence of Agglomerated Ore in the Blast-Furnace Charge.) Cornello Ricci. *La Metallurgia Italiana*, v. 41, May-June 1949, p. 121-127.

Operating results for three types of charge: lumps of Cogne magnetite; 50% lumps plus 50% ore sintered with blast-furnace gas; and 62.5% lumps plus 37.5% sintered briquets. The results are subjected to a critical mathematical analysis.

2B-290. Soufflage d'un convertisseur Thomas a l'air enrichi en oxygène. Essais exécutés aux forges de la Providence à Rehon. (Blowing a Bessemer Converter With Oxygen-Enriched Air. Experiments Conducted in the Providence Mill at Rehon.) M. Cornet. *Circulaire d'Informations Techniques*, v. 6, Apr.-May 1949, p. 185-209.

Factors investigated were: blowing a "cold" melt; nitrogen content of the steel; quality of the metal; blowing period; and proportion of ferroalloys which can be incorporated.

2B-291. Oxygenated Steel. *Industrial and Engineering Chemistry*, v. 41, Nov. 1949, p. 16A, 18A.

Present status of use of oxygen in steelmaking.

2B-292. Relative Reducibility of Some Iron Oxide Materials. E. P. Barrett and C. E. Wood. *U. S. Bureau of Mines*, Report of Investigations 4569, Oct. 1949, 17 pages.

Measurement of reducibility, preparation of materials for deoxidation tests, and test procedure. Variables affecting deoxidation.

2B-293. Influence of Free Carbon on Interphase Surface Tension in the System Silicate—Iron Sulfide. (In Russian.) A. A. Leonteva. *Kolloidnyi Zhurnal* (Colloid Journal), v. 11, May-June 1949, p. 176-177.

Interphase surface tension is about 15 times higher in a reducing atmosphere than in carbon crucibles in the same furnace. This is believed due to desorption of pulverized carbon particles and their reaction with iron sulfide and silicate.

2B-294. How To Conserve Manganese. J. C. Vignos. *Journal of Metals*, v. 1, sec. 1, Nov. 1949, p. 20-21.

Advantages and disadvantages of various methods in steelmaking.

2B-295. Relative Deoxidizing Powers of Some Deoxidizers for Steel. C. E. Sims, H. A. Saller, and F. W. Boulger. *Journal of Metals* (Transactions Section), v. 1, Nov. 1949 (*Transactions of the American Institute of Mining and Met-*

allurgical Engineers, v. 185), p. 814-824; discussion, p. 824-825.

In experimental work to test the deoxidizing powers of commonly available elements, Mn, V, and Ca were found to be no stronger than Si. None of these is able to reduce the FeO content of steel sufficiently to form Type II sulfides. Mg is disqualified from a practical standpoint. Al, Zr, Ti, and B all are capable of producing Type II sulfides. The theory that deoxidation is primarily a homogeneous reaction involving monoxides of Fe and the deoxidizing element is expounded. 15 ref.

2B-296. Evaluation of pH Measurements With Regard to the Basicity of Metallurgical Slag. Charles W. Sherman and N. J. Grant. *Journal of Metals* (Transactions Section), v. 1, Nov. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 898-903.

pH of ferrous slag extracts was studied over a wide range of slag compositions from neutral bisilicate slags of the blast-furnace type to highly basic slags achieved in the openhearth process. It was found that pH of an aqueous solution extracted from powdered slags varies directly with the number of mols of excess CaO present in the sample. The quantity, excess CaO, was found to be useful in estimating the desulfurizing power of certain MnO-free blast-furnace slags.

2B-297. Vyroba litiny s upravenou grafitisaci. (The Production of Modified Graphite Cast Irons.) Jiri Mackievic. *Hutnicke Listy,* v. 4, July 1949, p. 210-217.

Reviews foreign and domestic literature.

2B-298. Control of Openhearth Slags on the Basis of the pH Values of Their Water Suspensions. (In Russian.) M. S. Kovtun and A. D. Ogorodnyaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 994-996.

Possibility of characterizing composition of slag according to its pH value.

2B-299. The Activity of Sulphur in Liquid Iron; The Influence of Carbon. J. A. Kitchener, J. O'M. Bockris, and A. Liberman. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 49-60; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2b-182, 1948.

2B-300. The Reduction of Oxides of Iron as a Diffusion-Controlled Reaction. S. E. Woods. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 184-193; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2b-183, 1948.

2B-301. Some Correlations Between Variables Affecting Sulphur in Blast Furnace Iron. T. E. Brower and B. M. Larsen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 330-342.

Previously abstracted from *Metals Technology.* See item 2b-210, 1948.

2B-302. Note on the Distribution of Sulphur Between Molten Iron and Slag. Terkel Rosenqvist. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 541-542.

Previously abstracted from *Metals Technology.* See item 2b-208, 1948.

2B-303. The Constitution and Thermodynamics of Liquid Slags. F. D. Richardson. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 244-257; discussion, p. 317-344.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-13, 1949.

2B-304. The Thermodynamic Activity of Silica and of Oxides in Silicate Melts. M. Rey. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 257-265; discussion, p. 317-344.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-14, 1948.

2B-305. The Electrical Conductivity of Silicate Melts: Systems Containing Ca, Mn and Al. J. O'M. Bockris, J. A. Kitchener, S. Ignatowicz, and J. W. Tomlinson. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 265-281; discussion, p. 317-344.

For the range 1000-1800° C. Method of investigation and results of previous work. Mechanism of conduction. A tentative model of silicate melts containing metal oxides. Application of this model to several systems. 36 ref.

2B-306. Equilibrium Relationships in Systems Containing Iron Oxide and Their Bearing on the Problem of the Constitution of Liquid Open-Hearth Slags. P. Murray and J. White. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 287-296; discussion, p. 317-344

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2b-179, 1948.

2B-307. The Behaviour of Oxygen in Liquid Steel During the Refining Pe-

riod in the Basic Open-Hearth Furnace. S. Fornander. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 296-307; discussion, p. 317-344.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2b-181, 1948.

2B-308. The Physical Chemistry of Sulphur Removal in Steel Making. P. T. Carter. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 307-316; discussion, p. 317-344.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2b-180, 1948.

2B-309. Direct Oxidation in the Basic Open Hearth Process. E. B. Hughes and F. G. Norris. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 52-68; discussion, p. 68-77.

Previously abstracted from *Metals Technology.* See item 2b-132, 1948.

2B-310. Operation of Oxygen-Enriched Open-Hearth Furnaces. J. S. Marsh. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 78-89; discussion, p. 89-91

Previously abstracted from *Metals Technology.* See item 2b-167, 1948.

2B-311. Role of Thermochemical Factors in Basic Open Hearth Production Rate. T. E. Brower and B. M. Larsen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 92-107.

Previously abstracted from *Metals Technology.* See item 2b-209, 1948.

2B-312. Structure, Segregation and Solidification of Semikilled Steel Ingots. Michael Tenenbaum. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 108-163; discussion, p. 163-172.

Previously abstracted from *Metals Technology.* See item 2-240, 1947.

2B-313. A Quantitative Experimental Investigation of the Hydrogen and Nitrogen Contents of Steel During Commercial Melting. C. E. Sims, G. A. Moore, and D. W. Williams. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 260-278; discussion, p. 278-282.

Previously abstracted from *Metals Technology.* See item 2b-33, 1948.

2B-314. Kinetics of the Transfer of Sulphur Across a Slag-Metal Interface. Lo-ching Chang and K. M. Goldman. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 309-327; discussion, p. 327-329.

Previously abstracted from *Metals Technology.* See item 2b-131, 1948.

2B-315. Vanadium as a Deoxidizer. S. L. Case. *Iron Age,* v. 164, Nov. 17, 1949, p. 97-102.

Free translation of an article by A. M. Samarin and A. Yu. Polyakov [*Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 100-113.] Includes translator's critical comments. The derivation of equilibrium constants of vanadium in liquid iron, and relative deoxidation characteristics of vanadium and silicon.

2B-316. Openhearth Metallurgists Consider Oxygen and Manganese Conservation. S. W. Poole. *Metal Progress,* v. 56, Nov. 1949, p. 701, 722, 724, 726, 728, 730, 732, 734.

Report of Sept. 30 meeting of AIME's Openhearth Committee. Use of oxygen; British use of basic refractories; sulfur control in hot metal; conservation of manganese; ingot solidification; mold coatings and surface quality; and soaking-pit practice.

2B-317. Oxygen Injection Applied in Steel Foundry Melting. G. E. Bellew. *American Foundryman,* v. 16, Nov. 1949, p. 24-27.

Injection procedure, acid-electric-furnace melting, acid and basic openhearth melting, basic electric practice, basic openhearth furnaces, and melting of alloy steels.

2B-318. A Study of an Open Hearth Combustion System. Mac Sample. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1327-1334.

To ascertain the extent of potential improvements of the openhearth system, an intensive study is being made of one furnace of conventional design including Isley stack control. Results obtained have supplied an explanation for some variations in openhearth operation and have eliminated some weaknesses. Experimental equipment and procedure.

2B-319. A Radio-Active Technique for Determining Gas Transit Times in a Driving Blast Furnace. E. W. Voice. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 312-315.

New technique. Results obtained in the first experiment on a 20-ft. furnace. Radon is introduced at the tuyeres by firing of a detonator. A special gas-sampling apparatus is used.

2B-320. Slag Control in the Basic Open Hearth Furnace. I. G. Reginald Bashforth. *British Steelmaker,* v. 15, Oct. 1949, p. 489-494; Nov. 1949, p. 539-542.

Oct. issue: Constitution of basic openhearth slags, removal of phos-

phorus and sulfur, slag-metal reactions, maximum rate of production, reduction of metallic losses in the slag, durability of furnace hearth, control of refining, and reduction of nonmetallic inclusions. Nov. issue: Methods of slag formation, practical slag control, and application of the principles set forth.

2B-321. Gaseous Oxygen in Iron and Steel Production. D. J. O. Brandt. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 149-152.

Present situation and possible future trends.

2B-322. Increasing Open Hearth Production by Use of Oxygen, Better Refractories and Control of Slag. Erle G. Hill. *Yearbook of the American Iron and Steel Institute,* 1949, p. 139-154, discussion, p. 154-163.

Previously abstracted from preprint. See item 2B-151, 1949.

2B-323. Finished Steel Production; Possible Increase From Existing Equipment. R. F. Passano. *Yearbook of the American Iron and Steel Institute,* 1949, p. 192-214; discussion, p. 214-220.

Previously abstracted from preprint. See item 2B-149, 1949.

2B-324. Studies Relating to the Control of Sulphur in the Production of Pig Iron. Truman H. Kennedy and Arthur W. Thornton. *Yearbook of the American Iron and Steel Institute,* 1949, p. 222-242; discussion, p. 242-249.

Previously abstracted from preprint. See item 2B-150, 1949.

2B-325. Sulphur Control and Manganese Conservation in Open Hearth Furnaces. D. E. Babcock. *Yearbook of the American Iron and Steel Institute,* 1949, p. 250-312; discussion, p. 312-321.

Previously abstracted from preprint. See item 2B-205, 1949.

2B-326. The Distribution of Oxygen Between Molten Iron and Iron Oxide-Silica Slags. Gerhard Derge. *Yearbook of the American Iron and Steel Institute,* 1949, p. 368-387; discussion, p. 388-396.

Previously abstracted from *Industrial Heating.* See item 2B-232, 1949.

2B-327. The Chemistry of Metallurgical Slags. N. J. Grant and John Chipman. *Yearbook of the American Iron and Steel Institute,* 1949, p. 469-486; discussion, p. 486-491.

Previously abstracted from preprint. See item 2B-152, 1949.

2B-328. Some Notes on the Economics of Tonnage Steel Melting in the Electric Furnace. H. W. McQuaid. *Iron Age,* v. 164, Dec. 8, 1949, p. 86-92.

Improvements in electric-arc furnace design and operation, together with various adverse raw-material market conditions affecting open-hearth practice, make the electric furnace a strong competitor in the production of carbon and tonnage alloy grades of steel. Comparative cost data concerning these two methods and converter practice, and factors influencing economic conditions.

2B-329. Iron Blast-Furnace Slag: Production, Processing, Properties, and Uses. G. W. Josephson, F. Sillers, Jr., and D. G. Runner. *U. S. Bureau of Mines,* Bulletin No. 479, 1949, 304 pages.

A comprehensive summary. 554 ref.

2B-330. Gas and Fluid Flow; Experiments in a Side-Blown Converter Model. M. P. Newby. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 545-548; discussion, p. 598-601.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-284, 1949.

2B-331. Experimental Blast-Furnace; Investigations on Temperature and CO_2 Distribution. H. L. Saunders, G. B. Butler, and J. M. Tweedy. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 566-574; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-184, 1949.

2B-332. Materials Distribution. Part II. Compensated Charging in the Blast-Furnace. H. L. Saunders, and R. Wild. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 574-578; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-260, 1949.

2B-333. Steelmaking Slags; Effect of Sodium Oxide Additions. Part I. Use of Soda to Dephosphorize Pig Iron at 1,400° C. W. R. Maddocks and E. T. Turkdogan. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 578-582; discussion, p. 612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-283, 1949.

2B-334. Gas Transit Time; Radioactive Technique in Blast Furnace Studies. E. W. Voice. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 596-597; discussion, p. 609-612.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 2B-319, 1949.

2B-335. Tension superficielle et viscosité des scories synthétiques. Première partie. Mélanges binaires. Deuxième partie. Mélanges ternaires, mousses et émulsions de scories. (Surface Tension and Viscosity of Synthetic Slags. Part

One. Binary Mixtures. Part Two. Ternary Mixtures, Foams, and Emulsions of Slags.) (Concluded.) Paul Kozakevitch. *Revue de Métallurgie*, v. 46, Aug. 1949, p. 505-516; v. 46, Sept. 1949, p. 572-582.

Surface tension and viscosity were measured for a large number of slag systems, including 105 compositions from the $FeO-CaO-SiO_2$ system and 93 from the $FeO-MnO-SiO_2$ system at temperatures up to 1450° C. 73 ref.

2B-336. Consideraçoes Sobre a Fabricaçao de Ferro Esponija. (Factors in the Production of Sponge Iron.) Fernando A. de Toledo Piza. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 253-264.

Two methods for sponge-iron production. Concludes that sponge iron may be quite economically produced in Brazil.

2B-337. Estudo Sôbre a Redutibilidade Comparada de Alguns Minérios de Ferro Brasileiros. (Study of the Comparative Reducibility of Various Brazilian Iron Ores.) Geraldo Melcher and Carlos E. V. Cajado. *Boletim da Associaçao Brasileira de Metais*, v. 5, July 1949, p. 341-361.

A laboratory study of the production of sponge iron by hydrogen reduction.

2B-338. Silicon Losses During Smelting of Ferrosilicon. (In Russian.) P. V. Gel'd, O. A. Esin, N. N. Buinov, and R. M. Lerinman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 21, 1949, p. 1073-1076.

Losses amounting to about 15% of the Si were encountered. Investigation of products evolved and deposited indicated that part of the silicon is evaporated and condensed in the form of SiO, which forms a peculiar slag, resulting in formation of vitreous deposits on the furnace walls.

2B-339. The Bessemer Converter Process. A. B. Wilder. *Journal of Metals* (Technical Section), v. 1, Nov. 1949, p. 22-27; Dec. 1949, p. 20-28.

First section of a two-part article discusses investment costs, history, phosphorus and sulfur limitations, scrap-market conditions, blowing time, quality, and oxidation. Second section describes some recent developments such as oxygen-enriched blast, end-point evaluation, and temperature control.

2B-340. Experiments in Nodular Iron. E. K. Smith. *American Foundryman*, v. 16, Dec. 1949, p. 45-47.

Object of the experiments was to make nodular iron using commercial metal in regular production, both from the electric furnace and the cupola. Preliminary experiments demonstrated the suitability of a low-S, low-P cast iron, melted in an acid-lined arc furnace. In most of the experiments an alloy of 50% Mg and 50% Cu was used as nodulizing agent. Mechanical properties and microstructures.

2B-341. Bessemer Process. *Metal Progress*, v. 56, Dec. 1949, p. 878, 880, 882, 884, 886.

Reviews "Report on the Bessemer Process", *British Iron and Steel Institute*, Special Report No. 42, May 1949. See item 2B-255, 1949.

2B-342. Effect of Slag Types on Heat Treatment of Malleable Iron. G. Vennerholm and H. N. Bogart. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 222-224; discussion, p. 224-225.

Previously abstracted from *American Foundryman*. See item 2B-133, 1949.

2B-343. Some Effects of Deoxidation Treatments on Graphitization of White Cast Iron. Richard W. Heine. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 315-327; discussion, p. 327-331.

Previously abstracted from preprint. See item 2B-130, 1949.

2B-344. Symposium on Nodular Graphite Cast Iron. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 576-585; discussion, p. 585-587.

D. J. Reese discusses properties of ductile iron, thermal tèsts on spheroidal carbon iron, and malleable foundry production. C. K. Donoho considers the production of the above with Mg. Gosta Vennerholm discusses various methods of production and control of properties. R. G. McElwee sums up the discussion.

2B-345. Gases in Steel. E. W. Pierce. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 45-46; discussion, p. 65-73.

Correlation between atmospheric humidity and hydrogen content.

2B-346. Some Observations on Gases in Steel. C. E. Sims. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 46-52; discussion, p. 65-73.

Behavior of hydrogen in steel, its removal by aging, and effects of other gases.

2B-347. Kinetics of Gases in Steel. L. S. Darken. *Electric Furnace Steel Proceedings*, v. 6, 1948, p. 55-59; discussion, p. 65-73.

A model describing the rate of carbon drop in electric and open-

hearth furnaces based on the interface film. Hydrogen and nitrogen in the steel bath, hydrogen removal, and the relation between rate of elimination and gas content.

2B-348. The Electric Ingot Process. R. K. Hopkins. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 91-103; discussions, p. 103-105.

For special steels. Machine for casting ingots of definite length. Structure and mechanical properties of the product.

2B-349. The Kellogg Electric Hot-Top Process. R. K. Hopkins. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 106-118; discussion, p. 118-121.

2B-350. Use of Oxygen in the Manufacture of Basic Electric-Furnace Steels. John E. Harrod. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 123-127; discussion, p. 132-140.

Method of introduction; use for stainless, Mn, quality alloy, and rimming steel.

2B-351. Use of Oxygen in the Manufacture of Electric-Furnace Steels. A. C. Ogan. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 127-129; discussion, p. 132-140.

Practice variations at the Duquesne Works of Carnegie-Illinois Corp. from those at South Works.

2B-352. Use of Oxygen in Manufacture of Basic Electric-Furnace Steels. George P. Michalos. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 130-132; discussion, p. 132-140.

Outlines practice at Timken Roller Bearing Co.

2B-353. Relation Between Chromium and Carbon in the Refining of Chromium Steel. D. C. Hilty. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 140-148; discussion, p. 148-153.

The equilibrium constant and the influence of temperature on that constant were derived for the iron-chromium-carbon-oxygen reaction.

2B-354. Use of High-Purity Oxygen for Decarburization in Five-Ton Acid Electric Furnaces. Clyde Wyman, Edmund J. Goehring, and Charles A. Faist. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 154-167; discussion, p. 174-188.

Use of oxygen can be economical and practical if properly handled.

2B-355. Use of Oxygen in Acid Electric Practice. R. H. Jacoby and Marshall Petty. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 168-170; discussion, p. 174-188.

Trial operations at the Key Co., East St. Louis, Ill.

2B-356. Use of Oxygen in the Melting of Stainless Steels for Castings. R. J. Wilcox. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 170-174; discussion, p. 174-188.

Plant equipment, melting equipment, and melting practice. Compares cost and quality with conventional practices.

2B-357. Complex Deoxidizers in Electric-Furnace Cast Steel. H. A. Young. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 189-194; discussion, p. 212-225.

Compares effects of deoxidation additions on notched-bar impact properties and on relative type and arrangement of inclusions.

2B-358. Use of Complex Deoxidizers. G. A. Lillieqvist. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 194-198; discussion, p. 212-225.

Use of Al and Ca-Mn silicon for the control of porosity and inclusions.

2B-359. Effects of Complex Deoxidizers on Silicon-Killed Steels, With and Without the Addition of Aluminum. Paul E. Eubanks. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 199-207; discussion, p. 212-225.

2B-360. Use of Complex Deoxidizers. John N. Ludwig, Jr. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 208-212; discussion, p. 212-225.

Use of calcium metal and alloys. Metal conditions prior to use.

2B-361. Elementary Principles in Making a Normal-Alloy Electric-Furnace Heat. W. M. Farnsworth. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 226-230.

Slag-making materials, care of furnace, charging scrap, Cr-Ni-Mo heats, tests of the metal bath, tapping, and pouring.

2B-362. Method for Calculating Electric-Furnace Melting. George E. Wagner. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 230-232.

Method which may be applied as a basis for all melting calculations. Its value increases with increase in percentage of alloys.

2B-363. Graphical Method for Evaluating Openhearth Slags. (In Russian.) L. M. Tsylev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1245-1247.

Chart shows monetary values of slags to be used in the blast furnace as substitutes for iron ore can be read as a function of percentages of Fe, Mn, and lime.

2B-364. Kaltverfestigung und Erholung kohlenstoffarmer Bandstähle unter Berücksichtigung metallurgisch bedingter Werkstoffeigenarten. (Work-Hardening and Recovery of Low-Carbon Strip Steels as Related to Metallurgical Characteristics of the Material.) Georg Niebch and Jacques Brockhaus. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 329-336.

Object of investigation was to determine effect of melting method on mechanical properties of cold rolled and annealed strip steels and to find a method for equalizing the strength properties of steels produced by different methods. Includes a review of the literature and a discussion of test methods.

2B-365. Siemens-Martin-Stahlwerk mit Eigengruppenschaltung der Gaserzeuger je Ofen und anderen Zweckmässigen Betriebseinrichtungen. (Steel Mills With Gas Generators Connected to Each Furnace in Individual Groups and With Other Suitable Equipment.) Gustav Neumann and Otto Weber. *Stahl und Eisen,* v. 69, Oct. 13, 1949, p. 731-734.

The gas generators are installed so that each furnace can be operated independently; this permits close control of air, gas, and coal consumption; also several other advantages.

2B-366. Die Manganwirtschaft im Thomasstahlwerk. (Economizing on Manganese in the Basic Bessemer Plant.) Josef Klärding. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 691-695.

Several different ways of economizing on Mn. Shows that the deoxidizing effect of Mn can partly be replaced by other deoxidizing agents. Graphs indicate the most economic use of Mn for different types of steel.

2B-367. Physikalische und mechanische Betrachtungen über die Verbrennung im Siemens-Martin-Ofen. (Physical and Mechanical Observations on Combustion in the Openhearth Furnace.) Alfred Mund. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 706-711.

Views by German and foreign authorities are critically evaluated. An entirely new type of heating system is proposed. Its operation and effects, and advantages over more orthodox systems.

2B-368. Temperatur- und Flammenmessung beim Windfrischverfahren. (Temperature and Flame Measurement in the Converter Process.) Gerhard Gille and Jacob Willems. *Stahl und Eisen,* v. 69, Oct. 27, 1949, p. 759-762.

Simultaneous measurement of bath temperature and flame radiation discloses a relationship between melt temperature at the radiation maximum and final temperature. Equipment used.

2B-369. Beobachtungen zum Reaktionsablauf gegen Ende des Windfrischens mit Hilfe von Temperatur- und Flammenmessung. (Observations on Reactions Towards the End of the Converting Operation by Means of Temperature and Flame Measurements.) Jacob Willems, Gerhard Gille, and Heinz Höfges. *Stahl und Eisen,* v. 69, Oct. 27, 1949, p. 762-764.

Temperature of the melt has a determining effect on the slagging of iron and phosphorus. The radiation maximum occurs towards the end of the operation at various melting temperatures and phosphorus contents. These facts should be considered in determining the end of the melting period. 12 ref.

2B-370. Zink im Hochofen. (Zinc in the Blast Furnace.) Engelbert Sedloczek. *Stahl und Eisen,* v. 69, Oct. 27, 1949, p. 772-773.

Investigation of smelting an ore containing 1.47% Zn. Effects on the furnace lining.

2C—Nonferrous

2C-1. Degassing Nonferrous Metals. (Concluded.) E. Kurzinski. *Foundry,* v. 77, Jan. 1949, p. 88-91, 232-233.

Above practice, as applied to copper and various grades of copper-base alloys.

2C-2. The Scope for Saving in the Smelting and Extraction Side of the Non-Ferrous Industry. Stanley Robson. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 71-74; discussion, p. 74-76.

Discusses the above from the British viewpoint.

2C-3. The Morenci Smelter of Phelps Dodge Corporation at Morenci, Arizona. L. L. McDaniel. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 1-14.

The copper smelter, its mode of operation and equipment. The metallurgy of direct smelting; diagrams showing general plan of the works, arrangement of equipment, flowsheet, details of furnace construction.

2C-4. Uber die Beeinflussung der Kieselsäure-Reduktion bei der aluminothermischen Herstellung von Mangan. (The Effect of the Reduction of Silicic Acid on the Aluminothermic Production of Manganese.) Kurt Giesen and Wilhelm Dautzenberg. *Metallforschung,* v. 2, Dec. 1947, p. 355-362.

Experiments on the reduction of a

highly siliceous pyrolusite. The possibility of limiting the reduction of silica by use of different additives, thus preventing contamination of Mn by Si.

2C-5. Non-Ferrous Metallurgy Shows advances. A. W. Schlechten. *Engineering and Mining Journal,* v. 150, Feb. 1949, p. 112-116.

New devolpments in production metallurgy.

2C-6. Development of the Modern Zinc Retort in the United States. H. R. Page and A. E. Lee, Jr. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 73-77.

Clay retort practice together with a description of major developments since 1912. 10 ref.

2C-7. Cadmium Recovery Practice in Lead Smelting. P. C. Feddersen and Harold E. Lee. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 110-117.

Procedures and equipment. Practice at major lead smelters throughout the world. Cadmium recovery at the mill of Bunker Hill and Sullivan Mining and Concentrating Co., Kellogg, Idaho. Market specifications for cadmium.

2C-8. Zinc Volatilization. W. H. Dennis. *Mining Magazine,* v. 80, Feb. 1949, p. 80-85.

Principal methods for treatment of residues and slags.

2C-9. Zinc Industry. R. A. Young. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 78-80.

New developments in roasting, smelting, and sintering.

2C-10. Lead Metallurgists. W. T. Isbell. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 81-83.

1948 developments in smelting and refining.

2C-11. Electrolytic Zinc at Risdon, Tasmania. Major Changes Since 1936. S. W. Ross. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 211-217.

Changes include replacement of two-stage roasting by preliminary roasting followed by flotation of leach residue and roasting of flotation concentrate, continuous leaching of calcine; close control of H-ion concentration during purification for Fe removal; recovery of good grade Co oxide; production of some of the Zn as 99.99% grade; and increased output of cathode Zn by closer electrode spacing. Other plans now underway.

2C-12. A Method for Preparing Boron of High Purity. (In English.) Roland Kiessling. *Acta Chemica Scandinavica,* v. 2, No. 8, 1948, p. 707-712.

Preparing boron of high purity by reduction of BBr_3 vapor with hydrogen in a quartz tube. Apparatus and yield obtained at different temperatures and for different reaction times.

2C-13. Uber die Grundlage des Parkes-Prozesses. (The Principles of the Parkes Process.) E. Henglein and H. Nowotny. *Monatshefte fur Chemie und verwandte Teile anderer Wissenschaften,* v. 79, Dec. 1948, p. 629-637.

Discussion is based on Henglein and Koester's earlier investigation of the ternary systems of Pb-Ag-Zn and Bi-Ag-Zn, since the problem of removing silver from lead by liquation is, to a large extent, linked with the constitution diagram. Curves and phase diagrams. 11 ref.

2C-14. New Jersey Zinc Develops a New Condenser. E. H. Bunce and W. M. Peirce. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 56-62.

Condensing zinc from Zn-retort gases is difficult because these gases de-oxidize a small percentage of the Zn during cooling. This causes the formation of blue powder which must be reworked and accretions of rock oxide which must be removed. New type of condenser in which a motor-driven impeller fills the condensing chamber with showers of liquid Zn to scrub the gas-vapor stream. The heat of condensation is removed by water-cooling coils immersed in the Zn bath.

2C-15. Calculating Charges for the Precipitation Method of Antimony Smelting. Chung Yu Wang. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 67.

Fundamental reactions of the precipitation method now generally employed for smelting rich antimony sulfide ore. Calculation of iron, soda, and coal charges.

2C-16. Investigation of Parker and Webb Zinc Deposits, St. Lawrence County, N. Y. H. P. Hermance and Robert S. Sanford. *U. S. Bureau of Mines,* Report of Investigations No. 4417, Feb. 1949, 31 pages.

Results of beneficiation tests on the two ores. By milling them together a recovery of approximately 92% can be expected in a concentrate assaying 58% Zn.

2C-17. La fabrication électrothermique de l'Arsenic métallique. (Electrothermic Production of Metallic Arsenic.) Arturo Paoloni. *Journal du Four Electrique et des Industries Electrochimiques,* v. 57, Nov.-Dec. 1948, p. 127-131.

Methods using the ore known as "mispickel" (corresponding, approximately, to the formula FeAsS). Basic chemical reactions for the recovery of arsenic, and different types of electric furnaces comparatively analyzed for different methods of arsenic reduction.

2C-18. Electrolytic Refining of Antimony Bullion. David Schlain, John D. Prater, and S. F. Ravitz. *Journal of the Electrochemical Society,* v. 95, Mar. 1949, p. 145-160.

Antimony bullion of several compositions was electrolytically refined in an electrolyte composed of antimony trifluoride and H_2SO_4. Effects of electrolyte circulation and of variation in antimony content were studied.

2C-19. Roasting Arsenical Gold Ores and Concentrates. F. R. Archibald. *Canadian Mining and Metallurgical Bulletin,* v. 42 *(Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), Mar. 1949, p. 129-139.

Roasting as preparation of refractory gold ores and concentrates for cyanidation, with particular reference to operations at the mill of Beattie Gold Mines, Quebec. 23 ref.

2C-20. Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze. W. H. Baer and B. M. Loring. *American Foundrymen's Society,* Preprint No. 49, 1949, 5 pages.

100-lb melts made in air, under dry charcoal, and under damp charcoal were studied. First type of atmosphere produced most favorable mechanical properties.

2C-21. Electrolytic Preparation of Zinc Dust. *Canadian Chemistry and Process Industries,* v. 33, Mar. 1949, p. 216-217.

German method of production of zinc dust from sodium zincate solution, which results in a much purer material than that from the zinc retorts.

2C-22. Concentration of the SO_2 Content of Dwight-Lloyd Sintering Machine Gas by Recirculation. W. S. Reid. *Journal of Metals,* v. 1, sec. 3, Apr. 1949, p. 261-266.

Development of process for recovery of a commercial grade of SO_2 from the gases from above machines operating on a lead charge.

2C-23. Electroseparation of Technetium From Rhenium and Molybdenum. L. B. Rogers. *Journal of the American Chemical Society,* v. 71, Apr. 1949, p. 1507-1508.

Laboratory arc-melting furnace used for experimental investigation of alloys of Ti, Zr, Cr, Mo, or W. Consists of an enclosed water-jacketed copper crucible and a vertically movable, water-cooled, tungsten-tipped electrode.

2C-24. Transition of Sulfur, Contained in the Charge, Into Calcium Sulfide During Smelting. (In Russian.) V. I. Lukashin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 131-135.

The formation of the less stable compound CaS, soluble in slag and insoluble in metal, from the more stable compound CaO with reference only to the interaction of lime with sulfur vapor. Method of experiment and apparatus used.

2C-25. Arc Melting Refractory Metals. S. A. Herres and J. A. Davis. *Steel,* v. 124, May 2, 1949, p. 82-86, 135.

2C-26. Untersuchungen uber die Aluminothermie des Mangans. (Research on the Aluminothermic Production of Manganese.) K. Giesen and W. Dautzenberg. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 49-53.

In this process for reduction of Mn ore, the oxide stage has a great effect on the yield and purity of the resulting Mn. The effects of various grain-size and furnace-size factors.

2C-27. Einige grundlegende Gleichgewichte bei der Bildung metallurgischer Speisen. (Some Basic Equilibria in the Formation of Metallurgical Charges.) Hermann Kleinheisterkamp. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, June 1948, p. 65-72.

Experiments were undertaken to clarify the status of some previously uninvestigated systems of importance in blast-furnace smelting, with emphasis on sulfide ores of Cu or Cu-Pb containing Fe, Ni, Co, As, Sb, or Sn, or various combinations of these elements.

2C-28. Versuche zur Herstellung von Feinindium 99.99% aus Rohindium. (Experiments on the Production of Refined Indium (99.99%) From Crude Indium.) Reinhard Kleinert and Hermann Dreyer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, June 1948, p. 79-83.

Examines published methods and develops a more successful and relatively simple one in which the indium is extracted from solution by a three-step displacement process.

2C-29. Die Antimonanlage der Herzog Juliushutte. (The Antimony Plant of the Herzog Julius Mine.) Otto-Hermann Schutze. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, July 1948, p. 103-109.

Plant and its operation. Metallurgy of antimony and methods of extracting and refining it.

2C-30. Inverting Standard Furnace Increases Smelter Profits. *Engineering and Mining Journal,* v. 150, June 1949, p. 70-71.

How inversion of the bosh of the blast furnace has enabled a Pennsylvania operator handling copper scrap to almost triple capacity and greatly improve smelting practice. Coke consumption has been decreased from 25 to 10% of the charge.

2C-31. Analyse thermodynamique de la reaction d'equilibre 6Cu + $SO^2 \rightleftarrows$ $2Cu^2O$ + Cu^2S. (Thermodynamic Analysis of the Equilibrium Reaction 6Cu + $SO_2 \rightleftarrows 2Cu_2O + Cu_2S$.) Henry Lepp. *Revue de Metallurgie,* v. 46, Mar. 1949, p. 155-159.

The interaction of Cu_2O and Cu_2S follows the above equation over a very wide temperature range; and absorption of SO_2 by liquid copper is a purely chemical reaction according to the above formula.

2C-32. The Japanese Antimony Industry Utilizes Unique Method of Recovering Metal. *Mining World,* v. 11, June 1949, p. 46.

Lump ore is treated by the Herron Schmidt method. The stibnite is broken down by heat, the antimony volitalized, condensed, and recovered as Sb_2O_3, after which it is reduced to metal in a reverberatory furnace. Concentrates in the form of flotation froth are treated in a flash roaster. The froth is discharged into the roaster at 1000-1200° C. 99% of the antimony content is oxidized and volitalized. Gold and silver fall to the bottom of the roaster as finely divided metal.

2C-33. Making Fusible Alloys From Tin-Bearing Residues. A. G. Arend. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 18-19, 36.

New methods, including electrorefining, which have made earlier, more complex methods obsolete.

2C-34. Nickel Alloys: The Birmingham Works of Henry Wiggin and Company, Limited. J. O. Hitchcock. *Metal Industry,* v. 74, June 3, 1949, p. 439-441.

Work done and developments made. Refining and working processes.

2C-35. A Study of the Separation of a Trace of Silver From a Macro Amount of Palladium by Electrolysis. J. C. Griess, Jr., and L. B. Rogers. *U. S. Atomic Energy Commission,* AECD-2299, June 21, 1948, 16 pages.

Several complexing agents are used. Cyanide was found to produce the most favorable separation while allowing a nearly complete recovery of Ag. Repeated electrolyses are feasible, and the method can separate silver produced by neutron bombardment of lead, which has a high specific activity and which is chemically and radiochemically free from Pd. 22 ref.

2C-36. Um Apanhado Sobre o Estado Atual da Metalurgia do Litio. (Review of the Present State of Lithium Metallurgy.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais,* v. 5, Apr. 1949, p. 107-122.

Because of the increased demand for this metal and the large deposits of pegmatite in Brazil, the production of lithium in Brazil seems feasible. Comparative data for different methods of production; optimum methods as applied to Brazil.

2C-37. Um Apanhado Sobre o Estado Atual da Metalurgia do Zirconio. (Review of the Present State of Zirconium Metallurgy.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais,* v. 5, Apr. 1949, p. 123-142.

Bibliographical data concerning the physical and chemical properties of zirconium, method of production, and sphere of application. Different methods of zirconium recovery are critically analyzed. 18 ref.

2C-38. Um Apanhado Sobre o Estado Atual da Metalurgia do Columbio e do Tantalo. (Review of the Present State of Tantalum and Columbium Metallurgy.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais,* v. 5, Apr. 1949, p. 143-154.

Progress in the metallurgy of tantalum and columbium on the basis of the literature. Considering that Brazil is the major producer of these metals, improvement in methods for their recovery is of great importance to that nation. 17 ref.

2C-39. New Smelter to Produce Most of U. S. Antimony. *Engineering and Mining Journal,* v. 150, July 1949, p. 140-141.

New $1,500,000 antimony smelter being built near Stibnite, Idaho. Flow diagram.

2C-40. Inco Develops New Processes. *Engineering and Mining Journal,* v. 150, July 1949, p. 144.

Flash smelting process developed at Copper Cliff, Ontario, Canada. It will use oxygen and heat from flash roasting to smelt flotation concentrate. Savings will be in fuel cost and byproducts.

2C-41. Cominco's Streamlined Smelter. *Engineering and Mining Journal,* v. 150, July 1949, p. 139.

New lead smelter under construction at Trail, B. C.

2C-42. The Preparation and Some Properties of Ductile Titanium. H. W. Worner. *Metallurgia,* v. 40, June 1949, p. 69-76.

Using a modification of the Knoll process in which no protective atmosphere of helium is needed. Australian raw materials were used. Each particle of titanium powder produced was porous, suggesting that the metal formed as a sponge-like mass during the reduction reaction. The chief metallic impurities were Fe, Mg and Pb, but the latter two impurities could be practically eliminated either by melting in an argon atmosphere or by heating to 1000° C. for several hours in a vacuum. Powder-metallurgy and argon-arc-melting methods for compacting the powder; mechanical working of as-melted Ti; effect of cold drawing on mechanical properties and structure of Ti wire; and annealing techniques.

2C-43. Complex Sulfates Containing Tri- and Pentavalent Columbium and the Possibility of Their Use in the Purification of Columbium. Edward W. Golibersuch and Ralph C. Young. *Journal of the American Chemical Society,* v. 71, July, 1949, p. 2402-2405.

Above sulfates were prepared and their crystal structures examined. Suggests above possibility.

2C-44. Investigation of the Kinetics of Precipitation of Metals from Solutions for Application to the Theory of Hydrometallurgical Processes. (In Russian.) I. N. Ploksin and N. A. Suvorovskaya. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Mar. 1949, p. 407-412.

Performed experimental investigation permits establishment of two types of precipitation processes: one with more or less marked liberation of hydrogen, and one without such. Mechanisms of both processes. Data from a typical application of this method (precipitation of Cu by Fe or Zn from HCl or H_2SO_4).

2C-45. Production of Titanium Powder at Boulder City. F. S. Wartman. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 20-25; discussion p. 25-26.

See abstract from *Metal Progress,* item 2D-8, 1949.

2C-46. Production and Properties of Iodide Titanium. Bruce W. Gonser. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 60-68; discussion p. 68-69.

See abstracts from *Metal Progress,* items 2D-9 and 3C-55, 1949.

2C-47. Lower Oxides of Titanium in Slags of the Aluminothermic Process. (In Russian.) D. S. Belyankin, V. V. Bogolyubov, and V. V. Lapin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser. v. 65, Apr. 11, 1949, p. 685-688.

The possibility of the presence of TiO and Ti_2O_3 in above slags (aluminothermic reduction of titanium ores) was experimentally investigated. These compounds were found to exist, as shown by microscopic examination.

2C-48. Spectrographic Control in the Refining of Metals. D. M. Smith. *Institution of Mining and Metallurgy,* Preprint No. 1 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 10 pages.

Spectrographic detection and estimation of impurities in metals. Limits of detection, examples of control with various metals, and accuracy. 19 ref.

2C-49. The Refining of Gold and Silver. A. E. Richards. *Institution of Mining and Metallurgy,* Preprint No. 2 from symposium, "The Refining of Nonferrous Metals", July 1949, 47 pages.

Methods and underlying principles involved.

2C-50. The Refining of Bismuth. Alan R. Powell. *Institution of Mining and Metallurgy,* Preprint No. 3 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 9 pages.

Methods and underlying principles. 14 ref.

2C-51. Problems in the Production of Some of the Rarer Metals. Alan R. Powell. *Institution of Mining and Metallurgy,* Preprint No. 4 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 15 pages.

For the following processes: electrolysis from aqueous solutions and fused electrolytes, high-temperature reduction processes, and thermal-dissociation methods.

2C-52. The Fire Refining of Copper. H. J. Miller. *Institution of Mining*

and Metallurgy, Preprint No. 6 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 40 pages.

Refining of Cu by furnace methods, and subsequent casting of the metal into products. 37 ref.

2C-53. The Refining of Lead and Associated Metals at Port Pirie, South Australia. Frank A. Green. *Institution of Mining and Metallurgy*, Preprint No. 9 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 36 pages.

Metallurgical operations which include roasting and sintering of concentrates and other raw materials; blast-furnace smelting of sintered material; and refining of base lead bullion.

2C-54. Refining of Zinc. Stanley Robson. *Institution of Mining and Metallurgy*, Preprint No. 10 from symposium on "The Refining of Non-Ferrous Metals", July 1949, 16 pages.

Methods and equipment.

2C-55. The Aluminothermic Process and the Preparation of Commercially Pure Chromium, Manganese and Special Alloys such as Ferro Columbium. T. Burchell. *Institution of Mining and Metallurgy*, Preprint No. 15, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 20 pages.

History and general practices.

2C-56. Low-Carbon Ferro Chrome. J. A. Blake. *Institution of Mining and Metallurgy*, Preprint No. 16, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 9 pages.

Process (based on the Perrin process) for eliminating carbon from the final product.

2C-57. Cobalt Refining at Rainham Works of Murex, Ltd. P. S. Bryant. *Institution of Mining and Metallurgy*, Preprint No. 17, from symposium, "Refining of Non-Ferrous Metals", July 1949, 15 pages.

Separation of Cu, Fe, and of Co as a basic carbonate; calcination to gray or black oxides, purification of oxide; recovery of Co from leach liquors; and reduction of oxide to metallic globules and powders.

2C-58. Tungsten: Its Preparation for Use in Electronics and Carbide Products. T. F. Smeaton. *Institution of Mining and Metallurgy*, Preprint No. 18, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 20 pages.

Production of pure W from natural raw materials.

2C-59. The Production of Ductile Zirconium. G. L. Miller. *Institution of Mining and Metallurgy*, Preprint No. 19 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 12 pages.

History and current processes. 25 ref.

2C-60. Thermodynamics and Metallurgy of Tin Bronzes. Henry Lepp. *Metal Treatment and Drop Forging*, v. 16, Summer 1949, p. 67-76.

Applies the laws of thermodynamics to the Cu-Sn system and to the production of bronze alloys. Dominant reactions recurring in the production of the alloys and at various temperatures. Control of undesired reactions and the theoretical principles of refining and degassing by selective oxidation. 16 ref.

2C-61. Electrolytic Zinc Plant. Joseph S. Bowman. *Electrical Engineering*, v. 68, Aug. 1949, p. 673-676.

Electrolytic process used in the production of metallic zinc at an electrolytic zinc plant. Electrical features.

2C-62. The Use of Oxygen-Enriched Air in the Metallurgical Operations of Cominco at Trail, B. C. R. McNaughton, T. H. Weldon, J. H. Hargrave, and L. V. Whiton. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 446-450.

Use in the suspension roasting of zinc concentrates and in operations at the lead smelter. Precautions necessary for safe use of oxygen in any plant operation.

2C-63. A Thermodynamic Investigation of the System Silver-Silver Sulphide. Terkel Rosenqvist. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 451-460.

Apparatus in which the equilibrium gas ratio was obtained by circulating the gas mixture over the specimen, and the composition of the latter determined from its density by means of a buoyancy-balance. 22 samples containing up to 33.3 atomic % S were studied over the range 500-1300° C. Thermodynamic properties were calculated and relation between them and structure discussed. 18 ref.

2C-64. Autogenous Roasting of Low Grade Zinc Concentrate in Multiple Hearth Furnaces at Risdon, Tasmania. J. A. B. Forster. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 461-471.

Equipment and procedures.

2C-65. El Paso Slag Treatment Plant. T. J. Woodside. *Journal of Metals*, v. 1, sec. 3, Aug. 1949 (*Metals Transactions*, v. 185), p. 472-474.

Deals with a slag containing 10% Zn, from the lead blast furnace.

2C-66. Die Entwismutierung nach dem Kroll-Betterton-Verfahren. (Removing Bismuth by the Kroll-Betterton Process.) Dietrich Evers. *Zeitschrift für*

Erzbergbau und Metallhüttenwesen, v. 2, May 1949, p. 129-133.

An improved method by which the bismuth content of lead can be reduced to less than 0.01%.

2C-67. Thermodynamische Betrachtungen zum Kroll-Verfahren. (Thermodynamic Observations on the Kroll Process.) Hans Grothe. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, June 1949, p. 177-181.

Reactions resulting from introduction of Ca and Mg into the Bi-containing lead bath and phase equilibria in the Pb-Bi-Ca-Mg system. Conclusions regarding the amount of additions required for producing a lead with less than 100 g. per ton of Bi.

2C-68. Über die Oxydation ruhender Bleischmelzen. (The Oxidation of Static Lead Melts.) Wolfgang Gruhl. *Zeitschrift für Metallkunde,* v. 40, June 1949, p. 225-240.

The oxidation of pure Pb in air; structure of the oxide films and their effect on slagging; oxidation in pure oxygen; and effects of small additions of Li, Na, Mg, Ca, Al, Ca, Zn, Sn, Sb, Bi, Cu, and Ag. Method of experimentation and test results. 18 ref.

2C-69. Endotermicke reakce se soucasnym vyvinem plynu. (Endothermic Reactions With Simultaneous Evolution of Gas.) A. Krupkowki and J. Zemelka. *Hutnické Listy,* v. 4, Mar. 1949, p. 79-83.

An upper isothermal temperature of reaction can be distinguished, which is always above the equilibrium temperature. The difference between these temperatures characterizes the degree of superheating which exists. Experiments with reduction of ZnO with coal and coke, or charcoal, showed that reduction takes place below the upper isothermal limit, hence the rate is very slow. Increasing the rate of reduction was found to be difficult.

2C-70. Experiments on the Removal of Selenium and Tellurium From Blister and Fire-Refined Copper. W. A. Baker and A. P. C. Hallowes. *Bulletin of the Institution of Mining and Metallurgy,* Aug. 1949, p. 1-14.

Laboratory experiments on removal during conversion of matte by volatilization and by selective converting. Removal during fire-refining by addition of calcium and other elements. Some of the methods are believed applicable to full-scale working conditions.

2C-71. Preparation of Zinc by Electrolysis. Duisburger Kupfer Hütte, Duisberg. H. Shaw and O. Whitson. British Intelligence Objectives Sub-Committee, Final Report No. 930, Item No. 22, Nov. 29, 1945, 14 pages.

Preparation of pure zinc and burnt ore treatment at the Duisburger Copper Plant, Duisberg, Germany.

2C-72. High Temperature Equilibria in Metal—Metal Halide Systems. D. Cubicciotti. *U. S. Atomic Energy Commission,* MDDC-1058, June 1946, 20 pages.

Solution of metal in molten salt makes electrolysis of fused salts inefficient or, in some cases, impossible. Therefore, the solubility of a metal in a salt and factors influencing it are of some concern in electrochemical reduction from fused baths. Data mainly on the alkaline-earth metals and their halides. 46 ref.

2C-73. Über die Raffination von Zink und Zinklegierungen. (The Refining of Zinc and Zinc Alloys.) M. Schmidt. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 193-194.

Effects of impurities on the properties of refined Zn. Methods of removing Al by metals of the iron group and of liquating Al and Fe in two steps.

2C-74. Über die Herstellung von Mangankupfer aus Hochofen-Ferromangan. (The Production of Manganese-Copper From Blast Furnace Ferromanganese.) Wolfgang Gruhl. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, July 1949, p. 197-205.

Proposed liquation process which permits reduction of the Fe and C contents to a satisfactory degree. An alloy with 27% Mn and 2% Fe is found to have the optimum Mn-Fe ratio, but a small addition of Si will reduce the Fe content still further. Includes Mn-Cu-Fe phase diagram.

2C-75. Low Pressure Distillation of Zinc from Al-Zn Alloy. Max J. Spendlove and Hillary W. St. Clair. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 553-560.

First of a series on separation of nonferrous metals by distillation at low pressures. Although the experiments were confined to separation of Zn from Al, significance of the results is not confined to these metals. Distillation furnace and method for measurement of temperature and pressure.

2C-76. Antimony Production. W. H. Dennis. *Mine & Quarry Engineering,* v. 15, Sept. 1949, p. 289-296.

Occurrence, ore concentration, and various methods for production of the metal.

2C-77. Refining Metal Melts; Adaptation of Wet-Method Chemical Filtration. Reinacher. *Metal Industry,* v. 75, Sept. 2, 1949, p. 183-187.

Removal of iron and oxide impurities from Zn alloys; filtration of hyper-eutectic Al-Fe alloys and reduction of the Fe content of Al alloys by liquation and filtration after addition of Mg. Apparatus and methods used and results obtained.

2C-78. Production of Ductile Titanium at Boulder City, Nev. F. S. Wartman, J. P. Walker, H. C. Fuller, M. A. Cook, and E. L. Anderson. *U. S. Bureau of Mines, Report of Investigations* 4519, Aug. 1949, 37 pages.

Production of ductile-grade Ti powder in 100-lb. batches by reduction of purified titanic chloride with Mg, followed by grinding, leaching, and magnetic separation of the reaction product. Apparatus, technique, methods of controlling product quality, and some data on operating costs. 10 ref.

2C-79. A Decade of Electrolytic Manganese. Russell H. Bennett. *Engineering and Mining Journal,* v. 150, Oct. 1949, p. 80-84.

Includes a flowsheet of the electrowinning process. Economic factors and their bearing on the future of the process.

2C-80. Recent Progress in the Metallurgy of Malleable Zirconium. W. J. Kroll, A. W. Schlechten, W. R. Carmody, L. A. Yerkes, H. P. Holmes, and H. L. Gilbert. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 99-113.

Previously abstracted from Preprint 92-16. See item 2-263, 1947.

2C-81. Silver: Raw Material of the Electroplater. H. G. Dale. *Electroplating and Metal Finishing,* v. 3, Oct. 1949, p. 38-43.

History of silver production, extraction of the metal, and methods used to refine and prepare it for a plating anode.

2C-82. Segregation and Liquation of Alloys and Their Application to Nonferrous Metallurgy. Albert Portevin and Marc Dannenmuller. *Journal of the Institute of Metals,* v. 75, Aug. 1949, p. 949-972.

Surveys the various stages of solidification and the phenomena of segregation in alloys, under the headings of major segregation, minor segregation, and segregation after solidification. Major segregation is studied in detail. The second part deals with the industrial applications of segregation (liquation). Appendix describes briefly the procedure for the refining of commercial lead developed by Léon Jollivet. 19 ref.

2C-83. Kinetics of the "Cementation" Process. (In Russian.) B. V. Drozdov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, May 1949, p. 483-490.

Refining process for separation of Ni from Cu, based on a substitution reaction known as cementation, and which takes place on the surfaces of grains of Ni powder in an electrolyte. Results of theoretical and experimental investigation of the process, including effect of NaCl in the electrolyte. 10 ref.

2C-84. Titanium Investigations: Research and Development Work on the Preparation of Titanium Chloride and Oxide From Titanium Mattes. R. G. Knickerbocker, C. H. Gorski, H. Kenworthy, and A. G. Starliper. *Journal of Metals* (Transactions Section), v. 1, Nov. 1949 (Transactions of the American Institute of Mining and Metallurgical Engineers, v. 185), p. 785-791.

Development of a new method for preparing lower-cost $TiCl_4$ for commercial production of ductile Ti and preparing TiO_2 pigment. Results indicate possibility of producing $TiCl_4$ and TiO_2 from rutile by smelting with pyrite and coke and then processing the titanium matte. An impure iron is recovered as a byproduct. Ilmenite may be treated in the same way. 10 ref.

2C-85. Recovery of Zinc by the Dithionate Sulphur-Dioxide Leaching Process. S. F. Ravitz. *Journal of Metals* (Transactions Section), v. 1, Nov. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 792-795.

New process for treating oxidized Zn ores or low-grade Zn concentrates. Ore or calcined concentrate is leached with dilute SO_2, sulfate is precipitated by means of cyclic calcium dithionate, and Zn is recovered by precipitation with lime.

2C-86. La réduction du chlorure de glucinium par l'hydrogène. (Reduction of Beryllium Chloride by Hydrogen.) L. Hackspill and J. Besson. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. 113-116.

It was found experimentally that the temperature of the reduction is too near the melting point of the metal. Under such conditions, Be forms a low-melting alloy with tungsten. This difficulty has to be overcome, which is the goal of the research still in progress. 12 ref.

2C-87. Über die Aufarbeitung von bleiëschen Zwischenerzeugnissen im Kurztrommelofen. (Processing Lead-Containing Intermediates in a Short Revolving-Drum Furnace.) Jürgen Feiser.

Zeitschrift für Erzbergbau und Metallhüttenwesen, v. 1, Apr. 1948, p. 21-28.

Design and operation of the furnace and how it can be used in various ways for extracting the components of the above.

2C-88. Raffination von Werkblei im Raffinieroffen. (Refining of Raw Lead in the Refining Furnace.) Reinhard Kleinert. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, Aug. 1949, p. 233-239; Sept. 1949, p. 274-277.

Sequence of formation of oxidation products, reactions of Sb with oxygen and metal oxides, possible methods of increasing rate of oxidation, and effect of operating conditions on results of the refining process. Second installment: The continuous refining process used in the lead works at Port Pirie in Australia. Possible reactions of antimony during the refining process. 14 ref.

2C-89. Die Zinkoxyd-Verblaseöfen der Unterharzer Bergund Hüttenwerke. (The Zinc Oxide Blast Furnace of the Unterharz Mining and Smelting Plant.) Hans-Joachim Hellwig. *Zeitschrift für Erzebergbau und Metallhüttenwesen,* v. 2, Sept. 1949, p. 263-268.

New and improved installation for recovery of Zn and associated metals.

2C-90. Neuzeitliche elektrolytische Kupferraffination; Ihr Ausgangsmaterial und deren Nebenprodukte. (Modern Electrolytic Copper Refining; Final Product and By-Products.) Theodor Meissl. *Chemische Technik,* v. 1, Aug. 1949, p. 50-56.

A method of producing high-purity electrolytic copper and of extracting other metallic components from sludge.

2C-91. The Primary Reactions in Roasting and Reduction Processes. J. S. Anderson. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 163-173; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-18, 1948.

2C-92. A New Method for Studying the Mechanism of Roasting Reactions. E. A. Peretti. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 174-179; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2a-17, 1948.

2C-93. An Analysis of the Converting of Copper Matte. E. A. Peretti. *Faraday Society,* "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 179-184; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 2c-55, 1948.

2C-94. Modern Techniques in the Refining of Non-Ferrous Metals. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 157-163.

Reviews papers on refining of Cu, Al, Zn, and Mg presented at symposium on "Refining of Non-Ferrous Metals", Institution of Mining and Metallurgy, London, Summer 1949.

2C-95. Elettrometallurgia dello stagno. (Electrometallurgy of Tin.) Corrado Ferrante. *La Metallurgia Italiana,* v. 41, July-Aug. 1949, p. 190-198.

Chemistry and classical methods. Installation in which 15 tons per day of 99.96% Sn are produced from cassiterite.

2C-96. Waelz Plants for Low-Grade Tin. C. W. Jensen. *Mining Magazine,* v. 81, Nov. 1949, p. 265-268.

German smelting practice using low-grade concentrates.

2C-97. Vacuum Distillation Tests Indicate a Better Way To Treat Parkes Process Crusts. A. W. Schlechten and C. H. Shih. *Engineering and Mining Journal,* v. 150, Dec. 1949, p. 80-81.

Silver, 95% pure, was recovered from Parkes Process crusts by vacuum distillation in laboratory experiments. Recovery was made in only one step as compared with distillation plus cupellation plus recupellation involved in present commercial practice.

2C-98. Lead Smelting in the Ore Hearth. 1. Problems Involved in Smelting Rich Charges. G. L. Oldright. *U. S. Bureau of Mines,* Report of Investigations 4562, Nov. 1949, 18 pages.

Properties of lead compounds and limitations in roasting richer lead products. 11 ref.

2C-99. Recovery of Fumes From Chloride Volatilization of Gold. A. L. Engel and H. J. Heinen. *U. S. Bureau of Mines,* Report of Investigations 4582, Nov. 1949, 13 pages.

Reviews previous investigations. Test apparatus, furnace charge, volatilization test procedure, draft control, fume diffusion, addition reagents, and dust collection.

2C-100. Modern Billet Casting, With Special Reference to the Solidification Process. E. Scheuer. *Journal of the Institute of Metals,* v. 76, Oct. 1949, p. 103-120.

Requirements of an ideal billet-casting process outlined on the basis of the structure of an ideal billet. Conventional billet-casting methods fail to meet these requirements in

many respects, and developments aiming at overcoming these deficiencies are reviewed. The latest is the continuous-casting process. 21 ref.

2C-101. Petrology of High Titanium Slags. Charles H. Moore, Jr., and H. Sigurdson. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 914-919.

Preparation and petrographic technique for slags of the CaO-MgO-TiO_2-Al_2O_3-SiO_2 system produced from ilmenite ores reduced by carbon in an electric furnace.

2C-102. Laboratory Smelting of Titaniferous Ores. D. L. Armant and S. S. Cole. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 909-913.

Adaptation of melting-point data to slag formation is shown. Ilmenites containing 38-44% TiO_2 were smelted to produce fluid slags with 65-69% TiO_2. A high-Ti slag was produced in which the formation of appreciable amounts of trivalent Ti was avoided. They can be produced in an arc furnace with slag temperatures of 1450-1550° C. 11 ref.

2C-103. Melting Points in the System TiO_2-CaO-MgO-Al_2O_3. H. Sigurdson and S. S. Cole. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 905-980.

A micro-pyrometer and a platinum-strip furnace were used to determine the above. Since the purpose was primarily to provide useful data for smelting titaniferous ores, work was restricted to the zone of the system which would include the crystalline phases present in the slags. Results are shown on ternary diagrams and by spectrometer data.

2C-104. The Relationship Between Electrical Conductivity and Composition of Molten Lead Silicate Slags. A. Kenneth Schellinger and Robert P. Olsen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 984-986.

Straight-line plots are developed from the above relationships by use of logarithms and reciprocals. Use in determination of composition.

2C-105. Vacuum Distillation of Metals. *Metal Progress,* v. 56, Dec. 1949, p. 870, 876.

Summarizes "Low Pressure Distillation of Zinc From Al-Zn Alloy", by Max J. Spendlove and Hillary St. Clair, *Journal of Metals* (Transactions Section). See item 2C-75, 1949.

2C-106. Kinetics of Reduction of Copper Oxides by Carbon Monoxide and by Hydrogen. (In Russian.) E. P. Tatievskaya, M. G. Zhuraveleva, and G. I. Chufarov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1235-1241.

Experimentally investigated, comparing rates of reduction of CuO and Cu_2O. 10 ref.

2D—Light Metals

2D-1. The Production of Lithium Metal. R. R. Rogers and G. E. Viens. *Canadian Mining and Metallurgical Bulletin,* v. 41 (*Transactions,* v. 51), Nov. 1948, p. 623-628.

Properties and history of development. Experiments in which lithium alloys of Pb, Zn, Al, Mg, and Cu-Al were produced by electrolysis of a fused mixture of LiCl and KCl. In other experiments, pure Li was produced from the Pb-Li and Cu-Al-Li alloys by low-pressure distillation, and the corrosion resistance of several of the alloys was measured under various conditions. These preliminary experiments indicate commercial feasibility of the methods and superior corrosion resistance of the alloys.

2D-2. Modern Aluminum Cells. F. C. Frary. *Chemical Engineering,* v. 55, Dec. 1948, p. 123.

See abstract from *Journal of the Electrochemical Society,* item 2b-18, 1948.

2D-3. Verhalten einiger Fremdoxyde in der technischen Aluminium-Elektrolyse. (The Behavior of Several Oxide Impurities in the Industrial Electrolysis of Aluminum.) Joachim W. Fischer. *Angewandte Chemie,* sec. B, v. 20, Jan.-Feb. 1948, p. 17-23.

Results of systematic investigation of the effects of Na_2O, BeO, MgO, CaO, TiO_2, V_2O_5, Cr_2O_3, Mn_2O_3, Fe_2O_3, CuO, ZnO, and Ga_2O_3. Considerable information on the physicochemical reactions taking place during the process of electrolysis was thus obtained. 13 ref.

2D-4. Zur Frage der Gewinnung von Magnesium und Aluminium durch thermische Reduktion ihrer Chloride mit Wasserstoff. (The Problem of Production of Magnesium and Aluminum by Thermal Reduction of Their Chlorides With Hydrogen.) Oswald Kuba-

schewski. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 18-22.

The feasibility of the above was investigated on the basis of thermodynamic properties.

2D-5. Mikroskopische Untersuchungen bei der Veredelung von Silumin. (Microscopic Investigations of the Refining of Silumin.) Elisabeth Schulz. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 123-128.

It was found possible to refine Silumin (a silicon-containing aluminum alloy) by use of sodium. Results showed that the solubility of Na in Al at the freezing temperature is about 0.003%, and that Mg additions reduce the required amount of Na as well as retard its loss.

2D-6. Manufacture of Pure Titanium. *Light Metal Age,* v. 7, Feb. 1949, p. 16-17. Based on the work of S. F. Wartman and J. R. Long of U. S. Bureau of Mines.

Equipment and procedure to produce Ti in batches of about 15 lb. TiO_2 mixed with carbon is chlorinated to $TiCl_4$. The latter is reacted with Mg in a helium atmosphere to produce Ti and $MgCl_2$. Refining, pressing, sintering, and ingot forging follow. Potential uses.

2D-7. Production of Aluminum in Canada. G. M. Mason. *Canadian Mining and Metallurgical Bulletin,* v. 42 *(Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), Feb. 1949, p. 73-76.

Production by Aluminum Co. of Canada, Ltd., including extraction of alumina from bauxite.

2D-8. Production of Titanium Powder by the Bureau of Mines. F. S. Wartman. *Metal Progress,* v. 55, Feb. 1949, p. 188-190.

Study of the Kroll process, in which $TiCl_4$ is reduced with Mg in a helium atmosphere at 1475-1650° F. Titanium metal may be recovered by either of two methods from the solid mixture of Ti sponge, $MgCl_2$, and unreacted Mg.

2D-9. The Production of Titanium by the Iodide Process. Bruce W. Gonser. *Metal Progress,* v. 55, Feb. 1949, p. 193-194.

Process depends on formation of volatile titanium iodide by reacting crude titanium with iodine in the absence of any other reactive gas, then depositing the titanium on a hot filament by thermal decomposition of the iodide. The gaseous product of decomposition reacts with more crude metal. Development work done on the process at Battelle Memorial Institute.

2D-10. Induction Melting of Titanium in Graphite. J. B. Sutton and T. D. McKinley. *Metal Progress,* v. 55, Feb. 1949, p. 195.

Equipment for production of 10-lb. ingots. 100-lb. facilities have also been installed recently by du Pont, and procedures are being worked out for production of the large ingots.

2D-11. Induction Melting and Casting of Titanium Alloys. P. H. Brace. *Metal Progress,* v. 55, Feb. 1949, p. 196-197.

Search for a suitable refractory led to selection of ThO_2. Best results were obtained from a dense high-purity material fired at about 3600° F. The induction-melting apparatus is designed for operation in vacuum or controlled atmosphere.

2D-12. Arc Melting of Titanium. O. W. Simmons, C. T. Greenidge, and L. W. Eastwood. *Metal Progress,* v. 55, Feb. 1949, p. 197-200.

Arc furnaces developed at Battelle Memorial Institute are characterized by a water-cooled tungsten electrode, a water-cooled copper crucible, and provision for an inert argon atmosphere. Mode of operation and advantages.

2D-13. Grain Refining of Aluminum Alloys and Its Effect on Physical Properties. Walter Bonsack and O. Tichy. *American Foundrymen's Society,* Preprint No. 35, 1949, 12 pages.

Methods for grain refining by increasing rate of solidification and by employing grain refiners. Four types of Al alloys were studied, with Ti used as a refining addition.

2D-14. Fluxing of Aluminum Alloys. *American Foundrymen's Society,* Preprint 41, 1949, 3 pages.

Report of Sand Casting Committee, Aluminum and Magnesium Div. Removal of oxides and degassing. The materials used for each with respect to their relative merits. Precautions are also considered.

2D-15. Electrode Reactions in the Aluminium Reduction Cell. T. G. Pearson and J. Waddington. "Electrode Processes", *(Discussions of the Faraday Society,* No. 1, 1947) p. 307-320; discussion, p. 325-328.

Characteristic features when operating in the normal condition. Much of the experimental work and most of the theoretical arguments have already been published; how-

ever, new information on the constitution of molten cryolite electrolytes and on the conductivity of electrolytes containing calcium fluoride, and new work on the cause of CO formation in the anode gases. Also correlates the scattered literature data. 37 ref.

2D-16. Flussmittel in der Aluminiumgiesserei. (Fluxes for the Melting of Aluminum.) *Metall,* July 1948, p. 230-232.

Fluxes, according to their function, are of two general types, namely, oxide-dissolving fluxes used during the melting operation and for removal of slag; and fluxes used for removing gases and oxides shortly before the melt is cast.

2D-17. Resultats experimentaux et reflexions au sujet de l'emploi du procede Pfeiffer dans le controle du degazage des alliages legers dan les fours industriels de fusion. (Experimental Results and Comments Concerning the Application of Pfeiffer's Method for the Control of Degasification of Light Alloys in Industrial Melting Furnaces.) Jacques Pothelet. *Revue de Metallurgie,* v. 46, Mar. 1949, p. 160-162.

Critically analyzes method for determination of the gas content in light alloys. Concludes that it cannot be utilized for control of degasification of individual light-alloy melts. However, data obtained by this method may be used for improvement of the quality of products as a result of more thorough investigation of conditions of the melting process and factors which may cause gas inclusions.

2D-18. Uber die Herstellung metallurgischer Tonerde. (The Production of Metallurgical Alumina.) Part II. Friedrich Klema. *Mitteilungen des Chemischen Forschungsinstitutes der Industrie Osterreichs,* v. 3, Apr. 1949, p. 24-29.

Several new methods of extracting Al_2O_3 from low-grade and, especially, SiO_2-rich bauxites. 18 ref.

2D-19. Um Apanhado Sobre o Estado Atual da Metalurgia do Berilio. (Review of the Present State of Beryllium Metallurgy.) Tharcisio D. de Souza Santos. *Boletim da Associacao Brasileira de Metais,* v. 5, Apr. 1949, p. 155-179.

Existing metallurgical processes for beryllium production. Methods of recovery and main spheres of application. 19 ref.

2D-20. Tensione di decomposizione della allumina e meccanismo della elettrolisi nei forni industriali. (Decomposition Tendency of Alumina and Mechanism of Its Electrolysis in Industrial Furnaces.) A. Vayna. *Alluminio,* v. 18, Mar.-Apr. 1949, p. 147-152.

Reviews and comments critically on work of Cadariu, Gadeau, and Ferrand (presented in 1947).

2D-21. The Refining of Magnesium. E. F. Emley. *Institution of Mining and Metallurgy,* Preprint No. 12 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 31 pages.

Removal of insoluble nonmetallic impurities, removal of dissolved impurities other than gases; and degassing and grain refinement. 77 ref.

2D-22. Refining of Aluminum. J. Waddington. *Institution of Mining and Metallurgy,* Preprint No. 13, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 16 pages.

Reviews various processes. 21 ref.

2D-23. Catalytic Distillation of Aluminium. P. Gross. *Institution of Mining and Metallurgy,* Preprint No. 14, from symposium, "The Refining of Non-Ferrous Metals", July 1949, 10 pages.

Investigations carried out at the Fulmer Research Institute in England. Underlying theory.

2D-24. The Elements Present in Aluminium Casting Alloys With Some Notes on Methods for Their Introduction. D. C. G. Lees. *Murex Review,* v. 1, no. 4, 1949, p. 65-73.

2D-25. Extraction, Alloying and Fabrication of Magnesium. C. J. P. Ball. *Engineering,* v. 168, Aug. 5, 1949, p. 125-126; Aug. 19, 1949, p. 185-186. A condensation.

2D-26. Heat Contents and Heat of Formation of Magnesium Nitride; High Temperature Measurements. D. W. Mitchell. *Industrial and Engineering Chemistry,* v. 41, Sept. 1949, p. 2027-2031.

Data useful to metallurgists concerned with the production of magnesium.

2D-27. Über die Kornverfeinerung von Magnesium-Gusslegierungen. (The Grain Refining of Cast Magnesium Alloys.) G. Siebel. *Metall,* Nov. 1948, p. 357-363.

Effects of melting conditions, composition, superheating, chlorine, inorganic chlorides, organic chlorides, and other organic substances on grain structures and strength properties of Mn alloys. 10 ref.

2D-28. Die Entgasung von Aluminiumlegierungen (Versuche mit Chlor und Hexachloräthan). [The Removal of Gases From Aluminum Alloys (Experiments With Chlorine and Hexachloro-

ethane).] M. Grand. *Metall*, Dec. 1948, p. 406.

Some experimental results.

2D-29. Recovery of Aluminum From Crude Aluminum-Silicon Alloy by Extraction With Molten Zinc. Hillary W. St. Clair and D. D. Blue. *U. S. Bureau of Mines, Report of Investigations* 4535, Aug. 1949, 23 pages.

An experimental and economic study of practicability of refining crude Al-Si alloy or Al scrap containing Si and Fe by selective dissolution in Zn of the Al from the alloy, followed by distillation of Zn from Al. Feasibility was found to depend on finding a practicable and economical method of refining crude Al-Si alloy.

2D-30. Refining Metal Melts. Adaptation of Wet-Method Chemical Filtration. (Concluded.) Reinacher. *Metal Industry*, v. 75, Sept. 9, 1949, p. 211-213.

Recovery of Silumin and removal of oxide from the Al-Si system by liquation and filtration.

2D-31. The Vapour Pressure of Magnesium in the Thermal Reduction of MgO by Ferrosilicon. L. M. Pidgeon and J. A. King. *Faraday Society*, "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 197-206; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions*, Preprint. See item 2d-22, 1948.

2D-32. On Some Equilibria Involving Aluminium Monohalides. P. Gross, C. S. Campbell, P. J. C. Kent, and D. L. Levi. *Faraday Society*, "The Physical Chemistry of Process Metallurgy," Discussion No. 4, 1948, p. 206-215; discussion, p. 217-244.

Previously abstracted from *Faraday Society Transactions*, Preprint. See item 2d-21, 1948.

2D-33. Fluxing of Aluminum Alloys. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 307-309; discussion, p. 309.

Previously abstracted from preprint. See item 2D-14, 1949.

2D-34. Grain Refining of Aluminum Alloys and Its Effects on Physical Properties. Walter Bonsack and O. Tichy. *Transactions of the American Foundrymen's Society*, v. 57, 1949, p. 509-518; discussion, p. 518-520.

Previously abstracted from preprint. See item 2D-13, 1949.

SECTION III

PROPERTIES

3A—General

3A-1. Change in Hardness of a Metal Bar Under Low Cycles of Reversed and Pulsating Plastic Bending. Harry Majors, Jr. *ASTM Bulletin,* Dec. 1948, p. 39-43.

Effects of pulsating and reversed bending tests at low numbers of cycles of bending on the hardness of annealed Cu-Zn alloy and SAE 1112 annealed steel. Hardness increased with the number of cycles of bending, and no fiber had its original hardness after plastic deformation.

3A-2. Ferromagnetism. Edmund C. Stoner. *Reports on Progress in Physics,* v. 11, 1946-1947, p. 43-112.

General ideas and principles in development of theory. Theoretical and experimental work connected with intrinsic magnetization and its variation with field and temperature. 121 ref.

3A-3. Quantitative Treatment of the Creep of Metals by Dislocation and Rate-Process Theories. A. S. Nowick and E. S. Machlin. *National Advisory Committee for Aeronautics,* Report No. 845, 1946, 10 pages.

An equation for the steady-state rate of creep is derived by applying the theory of dislocations to the creep of pure metals. The form of this equation is in agreement with empirical equations describing creep rates. The theory was also used to predict the dependence of steady-state rate of creep on physical constants. Good agreement with literature data for pure annealed metals was obtained.

3A-4. The Physics of Metals. John C. Slater. *Physics Today,* v. 2, Jan. 1949, p. 6-13.

Proceedings of conference on metals of the International Union of Pure and Applied Physics, Amsterdam, July 1948.

3A-5. Strength of Metals. W. A. Wood and W. A. Rachinger. *Nature,* v. 162, Dec. 4, 1948, p. 891-892.

Progressive deformation of an annealed metal breaks down the grains into smaller crystallites which have a minimum size characteristic of the metal. Measurements of this limiting size were made for the body-centered cubic metals, Fe, Ta, Mo, and W, by an improved X-ray diffraction technique. The values thus obtained were related to maximum tensile strengths.

3A-6. Law of Eötvös and Surface Concentration of the Thermal Capacity of an Electron Gas. (In Russian.) A. Kh. Breger. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 920-924.

Temperature dependence of surface concentration on energy of the electron gas was established. The relationship of the surface tension of metals on their temperature is defined, at a sufficiently low temperature, by a quadratic function, in contrast with the law of Eötvös. Indicates that the theory of the surface concentration of thermal capacity, proposed by the author, is applicable to metals. 18 ref.

3A-7. Conditions of Formation of Plastic Deformation in Bodies of Simple Form, Rapidly Cooled at Their Surfaces. (In Russian.) B. N. Finkelshtein. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Aug. 1948, p. 1026-1028.

Proposes formulas for determination of the above conditions, which result in residual stresses. Proposed equations are analyzed.

3A-8. Vapor Pressure Data for Various Substances (A Graphical Presentation). R. R. Law. *Review of Scientific Instruments,* v. 19, Dec. 1948, p. 920-922.

Data for 36 substances commonly encountered in the field of electronics and high-vacuum research. Includes a series of metallic elements.

3A-9. Comportement d 'un fil aluminium-acier constitutif d 'une ligne de contact apres 175,000 passages de frotteurs. (Condition of a Steel-Reinforced Aluminum Trolley Wire After 175,000 Passages of the Friction Contact.) Louis Albert. *Revue de l'aluminium,* v. 25, Nov. 1948, p. 339-342.

The wire consists mainly of aluminum, but has an interlocked steel section along the bottom where contact with the trolley is made. The amount of wear as compared with copper cable was investigated. Influence of cable design, composition of the aluminum, and other factors on cable life.

3A-10. Deformation of Metals in Static and in Sliding Contact. A. J. W. Moore. *Proceedings of the Royal Society,* ser. A, v. 195, Dec. 7, 1948, p. 231-244.

Examinations of the depression in a copper surface made by a cylindrical indenter and by a hemispherical slider were made in presence and absence of a lubricant. Detailed examination of the surface damage produced during sliding shows that metallic junctions are formed and sheared during the sliding process, even when sliding speeds are so small that the temperature rise due to frictional heating is negligible. It is suggested that they are produced by cold welding of the surfaces. 22 ref.

3A-11. Stress and Strain States in Elliptical Bulges. C. C. Chow, A. W. Dana, and G. Sachs. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 49-58.

Strain state and curvatures exhibited by three bulge shapes, one circular and two elliptical, were analyzed experimentally using cartridge-brass sheet. An attempt is made to derive stress-strain relations for these bulges, which represent strain states in which the ratio of the two positive principal strains varies between 1.0 and 0.35. In addition, tension tests gave data for a value of —0.5 for this ratio. 21 ref.

3A-12. X-Ray Line Broadening in Cold-Worked Metals. M. S. Paterson and E. Orowan. *Nature,* v. 162, Dec. 25, 1948, p. 991-992.

The above approaches a limiting value as the amount of deformation increases. A possible cause is self-annealing. Since self-annealing must be insignificant at the temperature of liquid nitrogen, the limit ought to be very much higher or absent in metals cold worked at this temperature if due to thermal recovery or recrystallization. Experiments support the view that line broadening, being due to internal stresses, is limited by the fact that the shear stress cannot rise beyond the yield stress of the material.

3A-13. The Secondary Emission of Electrons by High Energy Electrons. J. G. Trump and R. J. Van de Graaff. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 44-45.

The secondary emission of electrons from tungsten, steel, aluminum, and graphite was studied as a function of the energy of the bombarding primary electrons in the range from 30 to 340 kilovolts.

3A-14. Die Temperaturabhängigkeit des Elastizitätsmoduls reiner Metalle. (The Temperature Dependence of the Elasticity Modulus of Pure Metals.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 1-9.

The above was determined for 32 very pure metals from —180° C. to the melting point, or up to about 1000° C., by determining the characteristic vibration frequencies of transverse vibrating bars. 31 ref.

3A-15. Die Aushärtung von Eisen-Zink- und Kobalt-Zink-Legierungen. (The Hardenability of Iron-Zinc and Cobalt-Zinc Alloys.) Jakob Schramm and Anton Mohrnheim. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 71-78.

Results of a study of the density, hardenability, and magnetic properties of sintered and annealed Fe-Zn and Co-Zn alloys. The Fe-Zn alloys were tested for their resistance to atmospheric and water corrosion. 10 ref.

3A-16 (Book). **Plastic Deformation; Principles and Theories.** Henry H. Hausner, editor. 192 pages. 1948. Mapleton House, 5415 17th Ave., Brooklyn 4, N. Y., $8.00.

Consists of 7 related papers: "On the Mechanics of Plastic Solids," L. N. Kachanov; "Theories of Plastic Deformation," N. H. Bellaev; "Some Problems in the Theory of Plastic Deformations," A. A. Ilyushin; "Relation Between the Theory of Saint Venant-Levy-Mises and the Theory of Small Elastic-Plastic Deformations," A. A. Ilyushin; "The Theory for Small Elastic-Plastic Deformations," A. A. Ilyushin; "Plastic Deformation of Thin Plates Under Hydrostatic Pressure," Wolfe Mostow; and "Plastic Deformation of a Thin Circular Plate Under Pressure," A. N. Gleyzal. The first five are free translations from the Russian periodical literature (1937-1946). The last two are reproduced from 1946 reports prepared for the U. S.

Navy Bureau of Ships, Underwater Research Group; and David W. Taylor Model Basin; respectively. All are highly mathematical, although some experimental data are included.

3A-17. Influence of Order on the Saturation Magnetic Moment. J. E. Goldman and R. Smoluchowski. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 310-311.

In a previous paper the authors reported the influence of ordering on magnestostriction of Fe-Co alloys. From the theory which explained satisfactorily these results it followed that the saturation moment of the ordered alloy should be about 4% higher than in the random alloy. Experimental confirmation.

3A-18. Low-Temperature Properties. *Metal Progress,* v. 55, Jan. 1949, p. 82, 84, 86. Based on four articles entitled: "Mechanical Properties of Metals and Alloys in Tension at Low Temperatures," V. I. Kostenetz, *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 16, no. 5, 1946, p. 515-554.

The properties of several commercially pure metals, nonferrous structural alloys, carbon steels, alloy steels, and solders, all at +63, −321, and −424° F.

3A-19. Stress-Strain Rate Relations for Anisotropic Plastic Flow. John E. Dorn. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 15-20.

A simple theory for stress-strain rate analyses during plastic flow of anisotropic sheet metals is proposed for the workhardening range. The effect of orientation on yield strength in simple and biaxial tension is discussed for various types of symmetry. The theory appears to be approximately correct for mild steel plates that exhibit planar isotropy. 17 ref.

3A-20. Heat Transfer in Sweat-Cooled Porous Metals. Sidney Weinbaum and H. L. Wheeler, Jr. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 113-122.

Formulas showing temperature distributions along the length of a sweat-cooled bar and across a sweat-cooled hollow cylinder are derived.

3A-21. The Theory of the Anomalous Skin Effect in Metals. G. E. H. Reuter and E. H. Sondheimer. *Proceedings of the Royal Society,* ser. A, v. 195, Dec. 22, 1948, p. 336-364.

See abstract of preliminary report from *Nature;* item 3a-41, 1948.

3A-22. A Metallurgical Investigation of Two Turbosupercharger Discs of 19-9DL Alloy. E. E. Reynolds, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note No. 1535, Nov. 1948, 25 pages.

Results of tests to determine properties at room temperature and at 1200° F. of this material in forgings of the size used in service. Both discs were given hot-cold-working treatments at 1300 to 1350° F., but one was solution-treated and the other was left in the as-forged condition.

3A-23. Influence of Tensile Stress on Magnetization of Ferromagnetic Materials in the "Para Process" Region. (In Russian.) K. P. Belov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 11, 1948, p. 807-809.

The "para process" region is the region of magnetic saturation. The above was investigated for four specimens (Ni, 80% Ni + 20% Cu, 64% Fe + 36% Ni, and 44% Fe + 56% Pt) with heating and cooling. Data indicate that the influence of elastic deformation on the change of magnetic saturation is thermodynamically the opposite of the magnetostriction of the "para process."

3A-24. Concerning One Method in the Theory of Elastic and Plastic Deformation. (In Russian.) I. I. Gol'denblat. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 21, 1948, p. 1001-1004.

A mathematical analysis based on certain assumptions which permit application to finite deformations.

3A-25. The Behavior of the Elastic Moduli of Alignment of Alloy Structure Near the Curie Point. (In Russian.) L. Kholodenko. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 812-817.

The above was investigated on the basis of the Landau theory of phase transformations of the second order. An expression is proposed relating the peaks of the temperature derivatives of elastic moduli with corresponding maxima for coefficients of thermal deformation and thermal capacity. A typical application of this formula to β-brass.

3A-26. Fluage et relaxation. (Creep and Relaxation.) Pierre Laurent and Mi-

chel Eudier. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 415-418; discussion, p. 418.

Critically analyzes the Boltzmann formula relating theoretically the above phenomena. The discrepancy between theoretical and experimental data is explained on the basis of a proposed new theory. Experimental data for a commercial aluminum alloy containing 9.7% Cu.

3A-27. Investigation of Antifriction Properties of Cast Iron "Ts-1" and Bronzes "OF-10-1" and "OTsS-6-6-3." (In Russian.) Ya. V. Vodzinskii and D. M. Shvarts. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 7-9.

Wear resistance was investigated using the Amsler testing machine under specific pressures of 28 and 40 kg. per sq. cm. for cast iron and 25 kg. per sq. cm. for the bronzes.

3A-28. Inwendige demping bij metalen. (Internal Friction in Metals.) H. C. den Daas. *Metalen,* v. 3, Dec. 1948, p. 73-77.

Reviews the various physical origins of internal friction, as far as they are known today. In general the sources of internal friction can be divided into two parts, diffusion effects and viscosity effects. 27 ref.

3A-29. Factors Responsible for Heat Stability of Heterogeneous Metallic Alloys. (In Russian.) K. A. Osipov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 1, 1948, p. 493-495.

The above were investigated for a series of ternary and quaternary alloys. Besides melting points of the components, the main factors involved are structure and composition of the intermediate phase, and its dependence on temperature and residual stresses.

3A-30. Die Wirkung der Vormagnetisierung auf die komplexe Permeabilität von Spulenkernen. (The Effect of Premagnetization on the Complex Permeability of Coil Cores.) R. Feldtkeller and E. Stegmaier. *Frequenz,* v. 2, May 1948, p. 121-130.

A mathematical and graphically illustrated discussion on the laws governing the above for Si-Fe and Ni-Fe sheet.

3A-31. Studies on Fly Ash Erosion. M. A. Fisher and E. F. Davis. *American Society of Mechanical Engineers,* Paper No. 48-A-53, 1948, 18 pages.

Investigation of the erosion of metals by the impingement of fly ash.

3A-32. Some Measurements of Heat Flow Along Technical Materials in the Region 4° to 20° K. K. R. Wilkinson and J. Wilks. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 19-20.

Measurements were made along specimens of various materials placed with one end at temperatures varying from 14 to 20° K. and the other at a temperature of 4.2° K. Results are given for Ni-Ag, Cu-Ni, stainless steel, Cu, and glass. Thermal conductivities at temperatures of 10-20° are derived.

3A-33. The Creep of Glass at High Temperatures. C. Crussard. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2471-2474, 2484.

Creep curves for glass are compared with those for metals. Creep recovery is less pronounced in the case of metals, while for glasses the deformation is almost irreversible. Since the same form of curve is found for metals, plastics, and glasses, the reason for creep cannot be existence of a particular structure.

3A-34. The Effect of Internal Stresses on Hardness. Paul Blain. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 135-136.

Experiments indicated that the surface hardness of steel, in the same condition of heat treatment, can vary in the ratio of 1 to 5 according to whether the metal is subject to stress or compression of the order of 165 kg. per sq. mm. in the region tested. This difference cannot be accurately measured by hardness tests using penetration methods. Instead, a nondestructive compression method was used.

3A-35. The Plastic, Creep and Relaxation Properties of Metals. A. E. Johnson. *Aircraft Engineering,* v. 21, Jan. 1949, p. 2-8, 13.

Experimental data on the departure from elastic behavior of a low-carbon steel in the range 20-550° C., and of an aluminum alloy in the range 20-200° C.; and of the creep properties under complex stresses of the low-carbon steel at 350° C., and of the aluminum alloy at 150-200° C. Details of methods and equipment, tables and graphs of data obtained, and mathematical analyses. 13 ref.

3A-36. The Physics of Sheet Steel. 25. The Probabilities of Cyclic Magnetisation. G. C. Richer. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 75-80, 86; Feb. 1949, p. 309-314, 318.

First installment of section 25 includes introduction; the hysteresis loop; hysteresis loss; coercive force; residual induction; and the cyclic induction curve. Second installment deals with the mechanism of coercive induction; the mechanism of

"springback" (residual induction); and cyclic discontinuities. (To be continued.)

3A-37. Methods of Determination of Deformability. (In Russian.) S. I. Gubkin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Sept. 1948, p. 1463-1482.

Critically analyzes existing mathematical and physical theories of deformation of solid bodies. Proposes a theory using dimensionless numbers for deformations between +1 and −1. On the basis of this assumption, equations are proposed and graphically interpreted.

3A-38. (Book). **Traité de Plasticité pour l'Ingénieur.** (Treatise on Plasticity for Engineers.) Ed. 2. F. K. Th. van Iterson. 191 pages. 1947. H. Vaillant-Carmanne, S. A., 4, Place St. Michel, Liege, Belgium.

A theoretical approach to a series of problems connected with plasticity. Different modern theories are analyzed. A new theory of the plastic state is developed and confirmed by experiment and by theoretical analysis. 82 ref.

3A-39. (Book). **Essential Metallurgy for Engineers. Ed. 3.** Archibald Comley Vivian. Sir Isaac Pitman and Sons, Ltd., Parker St., Kingsway, London, W. C. 2, England. 12s 6d. net.

The relationship of metallurgy to engineering, and some stimulating criticisms of commonly held views concerning strength of materials, more especially, the physical properties of steel. A concise summary of the metallurgical properties of metals, of amorphous and crystalline structure, of the technique used by the metallurgist, of alloy steels, nonferrous metals and alloys, and of heat treatments. There is also a glossary of metallurgical terms. (From review in *Engineering.)*

3A-40. Properties of Metallic Surfaces. R. M. Burns. "Pittsburgh International Conference on Surface Reactions", 1948, p. VI-VIII.

Previously abstracted from *Journal of the Electrochemical Society.* See item 3a-95, 1948.

3A-41. The "Wetting Effect" Strongly Affecting the Tensile Strength of Solids; "Liquo-Striction," a New Effect Resulting. Carl Benedicks. "Pittsburgh International Conference on Surface Reactions", 1948, p. 196-201.

A wetting effect may either increase or decrease the tensile strength of solids. This effect is said to explain corrosion fatigue, caustic embrittlement, season cracking, and soldering brittleness. "Liquo-striction" is defined as the length increase taking place on wetting. Such a small but measurable effect was shown experimentally to exist and to be affected by surface tension.

3A-42. Reactions of Metals in High Vacua. Earl A. Gulbransen and K. Andrew. "Pittsburgh International Conference on Surface Reactions," 1948, p. 222-236.

The nature of chemical reactions occurring in vacuum and at high temperature on various metals. These reactions are of three classes: those that form a gas; those that react with gases in the vacuum; and those that exchange one gas for another. Apparatus for studying these reactions at temperatures to 1200° C. and at pressures of 10^{-6} mm. Hg or better. A new type of high-temperature vacuum furnace tube which can be sealed to pyrex and is vacuum tight at 1200° C. Results of several experiments. 12 ref.

3A-43. Dislocation Theory and Transient Creep. N. F. Mott and F. R. N. Nabarro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 1-19.

The theory of dislocations, and application to the theory of transient creep, in the sense in which the term is used by Andrade (1911, 1914, 1932) and by Orowan (1947). 20 ref.

3A-44. The Creep of Metals. E. N. da C. Andrade. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 20-26.

Fundamental mechanisms of creep. Apparatus for determination of creep at homogeneous shear. Three methods for maintaining constant stress on specimens under axial tension during testing. 15 ref.

3A-45. The Yield Point of a Metal. Lawrence Bragg. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 26-29.

Theoretical analysis attempts to take account of the fact that slip alters the state of strain as it proceeds, so that one must consider the altered state in the region behind it as well as the pre-existing strain in the region it has not yet reached.

3A-46. Effect of Solute Atoms on the Behaviour of Dislocations. A. H. Cottrell. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 30-36; discussion, p. 36-38.

Solute atoms differing in size from those of the solvent can relieve hy-

drostatic stresses in a crystal and will thus migrate to regions where they can relieve the most stress. As a result they cluster round dislocations forming "atmospheres" similar to the ionic atmospheres of the Debye-Huckel theory. The conditions of formation and properties of these atmospheres; the theory is applied to problems of precipitation, creep, and yield point. 15 ref.

3A-47. On Slip Bands as a Consequence of the Dynamic Behaviour of Dislocations. F. C. Frank. "Report of a Conference on Strength of Solids", *The Physical Society*, 1948, p. 46-51.

It should sometimes be possible to produce a large change in the mode of slip in a single crystal by immersing it in a fluid of like or superior density, and thus suppressing the surface reflection of dislocations.

3A-48. Work-Hardening in Polycrystalline Pure Metals. R. L. Woolley. "Report of a Conference on Strength of Solids", *The Physical Society*, 1948, p. 51-56.

Observation of the plastic deformation of metals when the direction of stressing is reversed gives additional means of checking various theories of work hardening. Experimental results for copper can be explained by each of three theories, suitably modified.

3A-49. Thermoelectric Properties of Metals—Influence of Cold Work and Impurities. C. Crussard. "Report of a Conference on Strength of Solids", *The Physical Society*, 1948, p. 119-133.

The effect of deformation on thermoelectric properties of a wide variety of ferrous and nonferrous metals near room temperature. This effect consists of two parts, elastic and plastic. These effects on magnetic and nonmagnetic metals.

3A-50. The Excitation and Transport of Metal Vapour in Short Sparks in Air. G. C. Williams, J. D. Craggs, and W. Hopwood. *Proceedings of the Physical Society,* v. 62, sec. B, Jan. 1, 1949, p. 49-61.

Results of a study of excitation temperature in certain spark discharges of accurately known current characteristics. Excitation temperatures are found by measuring intensity ratios for certain spectral lines where the relevant transition probabilities are known. Certain peculiarities relating to the evaporation of electrode metal are described. 28 ref.

3A-51. An Adventure in Metallism. "I. R. Ontowit." *Metal Progress,* v. 55, Feb. 1949, p. 172-175.

The fundamental mechanism of brittle fracture and the extent to which the Charpy notched-bar impact test indicates serviceability. Use of elementary mathematical analysis.

3A-52. High-Temperature Properties of Rotor Disks for Gas Turbines as Affected by Variables in Processing. J. W. Freeman, Howard C. Cross, E. E. Reynolds, and Ward F. Simmons. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 36 pages.

Results of high-temperature tests on 24 large forged disks of eight heat resisting alloys, both low and high alloy. Short-time tension, rupture, creep, and stress-time for total deformation characteristics were determined at 1200, 1350, and 1500° F. 14 ref.

3A-53. The Resistivity of Thin Metallic Films. R. A. Weale. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 135-136.

A theoretical, mathematical analysis.

3A-54. Ferromagnetism at Very High Frequencies. II. Method of Measurement and Processes of Magnetization. M. H. Johnson and G. T. Rado. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 841-864.

A method for measuring the complex permeability of a ferromagnetic metal. Determination of both components is accomplished by simultaneous measurement of changes in attenuation and phase velocity introduced into a conducting system by the ferromagnetism of one of its walls. An experimental technique involving pulsed magnetic fields is used. Interpretation of results indicates several characteristics of magnetization in iron. Studies of hysteresis phenomena and results for two types of permalloy. 19 ref.

3A-55. Generation of Stresses of the Second Order During Plastic Deformation. (In Russian.) B. M. Rovinskii. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1273-1281.

Use of simple experimental methods. On the basis of x-ray investigation, the presence of two different types of 2nd-order stresses in crystals during plastic deformation was established.

3A-56. Increase in the Strength of Metals During Periodic Deformation in Contact With Surface-Active Lubricants. (In Russian.) T. Yu. Lubimova and P. A. Rebinder. *Doklady Akademii*

Nauk SSSR (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 159-162.

Newly discovered phenomenon was investigated for several ferrous and nonferrous metals and several surface-active liquids. Method of investigation; composition of surface-active substances. 10 ref.

3A-57. Le module d'élasticité et la limite de fatigue. (Modulus of Elasticity and Fatigue Strength.) Albert Kammerer. *Comptes Rendus* (France), v. 227, Nov. 29, 1948, p. 1144-1145.

Relationship between the two factors, and a proposed formula. Method of application of the proposed equation to metals.

3A-58. Les théories modernes du magnétisme et leurs applications. (Modern Theories of Magnetism and Their Applications.) Louis Néel. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 475-480.

Recent advances in theoretical knowledge concerning magnetic properties of metals and ways in which this information can be applied commercially.

3A-59. L'étalement des liquides sur les métaux en fonction de leur état de surface. (The Spread of Liquid on Metals as a Function of the State of Their Surfaces.) Robert Morlock. *Journées des Etats de Surface,* 1946, p. 219-222; discussion, p. 222.

The above was investigated for different liquids and for different states of surface. Two types of spreading were observed: spreading subject to the law of capillarity and spreading induced by molecular emission depending on the affinity of the liquid and the metal surface.

3A-60. Forgings—Ferrous and Nonferrous. N. Bruce Bagger. *Materials & Methods,* v. 29, Mar. 1949, p. 71-84.

Seven basic categories of forgeable metals from the standpoint of applications. Carbon steels; alloy steels; corrosion-resistant and heat-resistant steels; iron; Cu and Cu-base alloys; Ni and Ni-base alloys; light alloys. Heat treatment; coining, grinding, and straightening; machining; cleaning, plating, and polishing.

3A-61. On the Impact Behavior of a Material With a Yield Point. Merit P. White. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 39-52.

Analyzes longitudinal impact tests made by Clark and Duwez on an iron and a steel with definite yield points. Dynamic stress-strain relations for such materials appear to differ greatly from the static stress-strain relations, contrary to the case for materials without yield points.

3A-62. Effect of Residual Compression on Fatigue. D. Rosenthal, G. Sines, and G. Zizicas. *Welding Journal,* v. 28, Mar. 1949, p. 98s-103s.

In mild steel notched specimens, propagation of a fatigue crack can be slowed down appreciably by submitting the metal around the notch to residual compression. This treatment failed to produce the expected result when applied to a stress-relieved Al alloy. Further experiments are contemplated to ascertain whether the stress-relief heat treatment or the nature of the alloy is the determining factor.

3A-63. Some Fundamental Aspects of the Application of X-Rays to the Study of Locked-Up Stresses in Polycrystalline Metals. W. A. Wood. *Institute of Metals*, Symposium on Internal Stresses in Metals and Alloys, 1948, p. 31-34; discussion, p. 375-397.

Significance of internal strain values as determined by X-ray technique, and of the derived values of the internal stress or stresses in relation to values determined by other methods. When plastic deformation has occurred, the X-ray technique reveals variations in residual strain on a microscopic scale. The mechanical methods measure only the macro effect, whereas the X-ray technique measures the net effect of macro and micro stresses.

3A-64. Classification and Nomenclature of Internal Stresses. E. Orowan. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 47-59; discussion, p. 398-431.

The main types of internal stress are body-stresses, arising from nonuniformities of external influences; and textural stresses, due to textural inhomogeneities present either initially or produced by plastic deformation or structural changes. The possibility of investigating textural stresses in transparent single crystals or polycrystalline materials by means of polarized light. 28 ref.

3A-65. Laszlo's Papers on Tessellated Stresses: A Review. F. R. N. Nabarro. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 61-72; discussion, p. 398-431.

Four recent papers by Laszlo, published in *Journal of the Iron and Steel Institute* (1943-1945), are reviewed in detail. 18 ref.

3A-66. Internal Stresses Produced by the Sliding of Metals. F. P. Bowden and A. J. W. Moore. *Institute of Metals,* Symposium on Internal Stresses

in Metals and Alloys, 1948, p. 131-137; discussion, p. 398-431.

When a hemispherical steel surface slid over a copper surface a clearly defined track was formed. Tracks were produced under clean and under lubricated conditions. It was concluded that the stresses produced below the surface of the copper were formed by the formation and shearing of metallic junctions during sliding and that continued sliding would give a Beilby film with a distorted layer extending far beneath the surface.

3A-67. Some Internal Stresses in Turbine Rotors. Part I. Expansion Measurements on a Rotating Turbine Wheel. Part II. Estimation of Turbine Shaft Deflection When Heated Due to Relief of Residual Internal Stresses and Lack of Uniformity in Coefficient of Thermal Expansion. M. C. Caplan, L. B. W. Jolley, and J. Reeman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 139-152; discussion, p. 398-431.

3A-68. Effects Associated With Stresses on a Microscopic Scale. Lawrence Bragg. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 221-226; discussion, p. 432-462.

A formula for the limit at which a metal when sheared ceases to behave elastically and begins to undergo plastic deformation. The formula is based on the hypothesis that a slip process confined to a limited volume of the metal represents a local release of energy. It yields estimates of elastic limit of the same magnitude as those actually observed in cold-worked pure metals.

3A-69. Relaxation and Creep of Metals Considering Nonuniform Distribution of Stress. (In Russian.) I. A. Oding. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1561-1575.

Investigation assumed that plastic deformation proceeds by means of diffusion plasticity in the initial sections of the curves of creep and relaxation. On the basis of the diffusion equation, formulas are proposed for initial sections of relaxation and creep curves, corresponding well with experimental data. 10 ref.

3A-70. (Book.) **Wear, As Applied Particularly to Cylinders and Piston Rings.** F. P. Bundy, T. E. Eagan, and Ralph L. Boyer. 129 pages. Kokosing Press, Mt. Vernon, O. $3.50.

Theory of friction and wear of piston rings and cylinder walls. Constant and variable pressure wear tests with a new type machine. Theoretical considerations of wear and results of wear testing done by Cooper-Bessemer Corp. Design aspects of cylinder and ring wear.

3A-71. (Book.) **Report of a Conference on Strength of Solids Held at the H. H. Wills Physical Laboratory, University of Bristol, on 7-9 July 1947.** 162 pages. 1948. The Physical Society, 1 Lowther Gardens, Prince Consort Road, London, S.W. 7, England.

Nineteen papers classified under the headings: Creep and plastic flow; grain boundaries and recrystallization; precipitation; and fracture. Effects of mechanical working and heat treatment are dealt with. Individual papers are abstracted separately.

3A-72. The Friction of Dry and Lubricated Surfaces as Determined by the Stick-Slip Method. F. Morgan, M. Muskat, and D. W. Reed. *Lubrication Engineering,* v. 5, Apr. 1949, p. 75-82, 103.

Results of a friction survey of various metal combinations made with an apparatus similar to that of Bowden and Leben. Apparatus and technique. Method for calculation of friction coefficients and statistical analysis of the data. 12 ref.

3A-73. Complementary Minimum Principles for an Elastic-Plastic Material. H. J. Greenberg. *Quarterly of Applied Mathematics,* v. 7, Apr. 1949, p. 85-95.

The mechanical behavior of bodies consisting of an isotropic elastic-plastic material which obeys the stress-strain law of Prandtl and Reuss. Such material has a sharply defined yield point and does not exhibit work hardening. Assumed to be incompressible in the elastic as well as the plastic range. 14 ref.

3A-74. Recent Developments in the Mathematical Theory of Plasticity. William Prager. *Journal of Applied Physics,* v. 20, Mar. 1949, p. 235-241.

The general technique used in the discussion of stress-strain laws for inviscid elastic-plastic materials with work hardening. The case in which mechanical state is determined by the components of stress and permanent strain is investigated. Various problems of plastic equilibrium. 30 ref.

3A-75. A Cloud-Chamber Study of Meson Absorption by Thin Pb, Fe, and Al Foils. W. Y. Chang. *Reviews of Modern Physics,* v. 21, Jan. 1949, p. 166-180.

Review of literature; experimental arrangement; results. 30 ref.

3A-76. Fundamentals of Creep. Howard Scott. *Metal Progress,* v. 55, Mar. 1949, p. 343-344.

Takes issue with conclusion in Feb. 1948 issue that there is no correlation between creep and tensile strength. Defends use of complex "practical" alloys, which, although containing at least eight or nine metallic components, behave in a regular and predictable manner.

3A-77. Deltamax—A New Magnetic Core Material. W. S. Spring. *Iron Age,* v. 163, Mar. 31, 1949, p. 70-73.

Techniques for economically producing a 50% Ni-Fe alloy having, in addition to a rectangular hysteresis loop, sharply defined knees, low coercive force, and a useful range of induction in excess of 26 kilogausses. Predicted that this material, which will soon be economically available as toroidally-wound cores, will find wide application in the electronics field.

3A-78. Magnetic Intensity of Certain Iron-Nickel Alloys and Lag of Change of Magnetization. (In Russian.) R. V. Telesnin. *Zhurnal Eksperimental 'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Nov. 1948, p. 970-975.

The magnetic intensity of binary alloys containing 43-78.5% Ni was investigated. Strong dependence of magnetic intensity on elongation of the test specimen; a new phenomenon of lag in change of magnetization consisting of reversal of the magnetization vector. Method of investigation. 13 ref.

3A-79. Study of the Plasticity of Sheet Material. (In Russian.) Ya. B. Fridman and A. A. Bat. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1462-1469.

Investigated for a series of different materials, including steels with high mechanical properties, under tensile stress on plain and notched test specimens. Theoretical conclusions and experimental data.

3A-80. The Role of "Dislocation" in the Process of Creep. (In Russian.) I. A. Oding. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Dec. 1948, p. 1795-1802.

Analyzes all possible mechanisms for strengthening and weakening of metals during creep on the basis of the theory of dislocation. Application of this theory is said to resolve certain controversies concerning the mechanism of the creep process. Describes an additional mechanism of weakening caused by "dislocation" of the strength of metals.

3A-81. Sur la déformation plastique et la rupture des métaux. (Plastic Deformation and Fracture of Metals.) Pierre Laurent and Raymonde Laurent-Lamothe. *Revue de Métallurgie,* v. 45, Dec. 1948, p. 515-520.

The plastic deformation of monocrystals, twinned crystals, and polycrystals. Factors involved in fracture after plastic deformation are analyzed for mono and polycrystals. The role of plastic phenomena, particularly in fatigue and stress corrosion.

3A-82. Dynamic Torsion of Metals and Alloys Used in Aircraft Construction. Their Elastic Limit and Micro-Plastic Deformation Under Reversed Torsional Energy Loads. Parts I and II. Georges Welter. *Metallurgia,* v. 39, Feb. 1949, p. 188-190; Mar. 1949, p. 253-256.

Results of investigation on maximum possible impact loads with no permanent micro-deformation under torsion loads. Static properties, dynamic loads necessary to attain first permanent deformations, as well as those up to the yield point of the material. Specially devised torsional-testing impact machine used for applying repeated and increasing dynamic loads. Part II gives data on Duralumin 24 ST, Mg alloy 57S, mild steel and Ni-Cr steel. (To be continued.)

3A-83. The Cause of Anisotropy in Permanent Magnet Alloys. K. Hoselitz and M. McCaig. *Proceedings of the Physical Society,* v. 62, sec. B, Mar. 1, 1949, p. 163-170.

Measurements of magnetostriction. It is concluded that the domain magnetization is, in the absence of a field, along the crystallographic direction which makes the smallest angle with the axis of anisotropy. Effects of tempering.

3A-84. On the Surface Free Energy of Certain Metals. K. Huang and G. Wyllie. *Proceedings of the Physical Society,* sec. A, v. 62, Mar. 1, 1949, p. 180-191.

Model for calculating surface energy and surface double layer for a number of monovalent metals. Valence electrons are treated according to a Sommerfeld model, and positive charge is distributed uniformly through the metal. Peculiarly low values of surface tension in monovalent metals result directly from properties of free electron gas. 15 ref.

3A-85. Metals in Instruments; A Metallurgical Survey of the Materials

Used. E. H. Bucknall. *Metal Industry,* v. 74, Mar. 4, 1949, p. 163-165, 173; Mar. 11, 1949, p. 183-185; Mar. 18, 1949, p. 209-210.

Applications which are dependent upon possession of physical properties at a specially low, high, or constant level, in combination with satisfactory engineering properties. Special attention is given to thermal expansion, elastic modulus, and magnetic properties. Part 2 deals with use in length standards, with thermostatic bimetals, and with glass-to-metal seals. Part 3 deals with ferromagnetism and temperature control applications. 39 ref.

3A-86. The Physics of Sheet Steel. 25. The Problem of Cyclic Magnetisation. (Continued.) G. C. Richer. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 525-526, 528; Apr. 1949, p. 742-746, 750.

A working generalization of the B-H relationships in the Rayleigh region of the cyclic induction curve. Extent of agreement between experiment and theory for "single-phase" conditions. April installment describes hypothetical generation of families of hysteresis loops and the Steinmetz law of variation of cyclic hysteresis loss with maximum cyclic induction.

3A-87. Theories of the Mechanical Properties of Metals. N. F. Mott. *Research,* v. 2, Apr. 1949, p. 162-169.

Critically reviews existing theories, showing need for a broad program of experimental research to reduce the subject to quantitative terms. 28 ref.

3A-88. The Fatigue Problem in Metals With Special Reference to Wire Materials. John N. Kenyon. *Wire and Wire Products,* v. 24, Apr. 1949, p.317-319.

First of a series reviews briefly the historical development.

3A-89. (Book) **Zharouporny Splav.** (Heat Resisting Alloys.) Vol. 3. I. I. Kornilov. 120 pages. 1947. Academy of Sciences of the USSR, Moscow, U.S.S.R.

Results of theoretical and experimental investigation of the most important factors in developing heat-resisting alloys. Solid solutions of iron with a series of alloying elements were studied thoroughly, particularly regions of the constitution diagram which include heat resistant materials. It is shown that the ternary system Fe-Cr-Al represents the most important combination of elements for use between 800 and 1500° C. Two alloys have been developed and introduced industrially in the USSR, replacing the Ni-Cr alloys and platinum. 48 ref.

3A-90. Considerations sur l'électrochimie des métaux. (Discussion of the Electrochemistry of Metals.) R. Piontelli. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 45, June 1948, p. 115-122.

An important group of electrochemical properties of metals such as oxygen affinity, polarizability (anodic and cathodic), polarographic behavior. Attempt is made to interpret these properties more comprehensively. 17 ref.

3A-91. Plastic Stress-Strain Relations. W. M. Shepherd. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 39, 1948, p. 95-99; discussion, p. 99-114.

Relations applicable to problems in which elastic and plastic strains are of comparable magnitude. Two alternative criteria are used, one based on the Mises-Hencky function and the other on the maximum shear stress. Shear-stress-shear-strain curves are deduced from tensile-stress-strain curves and the result in one case compared with experiment. The problem of a thin tube strained in tension beyond the plastic region and then subjected to an increasing torque, and the tensile and shear strains due to the torque.

3A-92. Quelles sont les propiétés fondamentales essentielles permettant de caractériser les propiétés mécaniques des matériaux? (Which of Their Fundamental Properties Are Essential to Characterization of the Mechanical Properties of Materials? Carl Benedicks. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 1-6; discussion, p. 6-7.

Proposes a simplified diagram for determining the above, based on four fundamental parameters: elastic limit, maximum elongation without permanent deformation, yield point (maximum tensile strength), and maximum elongation before fracture. 24 ref.

3A-93. Application of Reaction Rate Principles to Some Mechanical Properties of Materials. Edward Saibel. *Transactions of the New York Academy of Sciences,* ser. 2, v. 11, Feb. 1949, p. 135-147.

How the above has been accomplished in several cases. Such phenomena as creep, viscosity, and fatigue can only be fully explained by application of physical principles analogous to those of chemical reaction. Discussion of theory of the rate of propagation of fracture cracks in metals. 18 ref.

3A-94. Thermal Contact Resistance of Laminated and Machined Joints. A.

W. Brunot and Florence F. Buckland. *Transactions of the American Society of Mechanical Engineers,* v. 71, Apr. 1949, p. 253-256; discussion, p. 257.

Values for two types of joints: between two blocks of laminated steel, either in direct contact or separated by cement or shims of steel, aluminum, or aluminum foil; and between two blocks of cold rolled steel with various surface finishes. The resistance measured amounts to 0.3 to 8 in. of additional material depending upon configuration. Results in terms of contact resistance.

3A-95. Thermal Resistance Measurements of Joints Formed Between Stationary Metal Surfaces. N. D. Weills and E. A. Ryder. *Transactions of the American Society of Mechanical Engineers,* v. 71, Apr. 1949, p. 259-266; discussion, p. 266-267.

Results of measurements on dry and oil-filled joints between two flat surfaces of various metals. Thermal resistance is decreased by increasing temperature and pressure, by inclusion of oil, or by plating the surfaces with a soft metal.

3A-96. Influence d'un champ magnétique sur le frottement interieur des ferronickels réversibles. (Influence of Magnetic Field on the Internal Friction of Reversible Ferronickels.) Charles Apert and Robert Cabarat. *Comptes Rendus,* v. 228, Feb. 7, 1949, p. 490-492.

Investigated on test specimens with 30-90% Ni content, and annealed at 800° C. for 7 hrs. at atmospheric pressure. Internal friction rapidly increases for low values of magnetic field, reaches a maximum, then decreases to practically a constant value at 300 oersteds. Influence of Ni content.

3A-97. Die technische Magnetisierungskurve. (The Technical Magnetization Curve.) Walther Gerlach. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Mar. 15, 1949, p. 127-133.

"Technical magnetization" is defined as the condition resulting from spontaneous magnetization by external magnetic fields. Stress-conditioned direction of spontaneous magnetization, the "180° processes", the Barkhausen Effect, the Sixtus-Tonks effect, and the Matteucci effect. Normal magnetization curve and heat of hysteresis are explained, and "technical magnetization" reactions are analyzed on the basis of changes in electrical resistance. Practical applications of the research.

3A-98. The Seizure of Metals. F. P. Bowden and D. Tabor. *Engineer,* v. 187, Apr. 8, 1949, p. 395-397. A condensation.

Mechanisms involved. Part played by localized welding at points of intimate contact, with the consequent formation of metallic junctions between surfaces. This welding is due largely to intense local pressure which produces plastic flow at the summits of surface irregularities. Even under static conditions, or at low sliding speeds, intermetallic junctions may be formed by "cold welding" and strong adhesion may occur. Effects of oxide films, of soft metals, of boundary lubricants, or of hard metallic films in reducing localized adhesion and seizure. 18 ref.

3A-99. Elastizität Fester Körper. (Elasticity of Solids.) Werner Köster. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 119-125.

Reviews German contributions, 1939-1946, to measurement of modulus of elasticity, measurements of single crystals, effects of different factors on the modulus, and general considerations. 34 ref.

3A-100. Plastizität Kristalliner Stoffe. (Plasticity of Crystalline Substances.) Albert Kochendörfer. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 126-143.

Reviews German contributions during 1939-46 on forming of single and polycrystals. 72 ref.

3A-101. Härte Fester Körper. (Hardness of Solids.) Theodor Pöschl and Helmut Buckle. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 144-153.

Reviews German contributions of 1939-46 to macro and microhardness and their measurement. 28 ref.

3A-102. Wärmeleitung in Festen Körpern. (Heat Conduction in Solids.) Walter Meissner and Gerhard U. Schubert. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 212-220.

Reviews German contributions during 1939-46, including methods of determination. 38 ref.

3A-103. Diffusion in Festen Körpern. (Diffusion in Solids.) Werner Braunbek. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 221-228.

Reviews German contributions for the period 1939-46, including investigation methods, diffusion of gases in solids, diffusion of solids in each other, practical diffusion problems, and theory of diffusion. 53 ref.

3A-104. Magnetische Eigenschaften Nichtferromagnetischer Körper. (Magnetic Properties of Non-Ferromagnetic Bodies.) Walter Klemm and Eckhardt Vogt. "Physics of Solids" *(Office of Military Government for Germany)*, Part II, p. 1-26.

German contributions during 1939-46. Covers both metallic and nonmetallic substances. 76 ref.

3A-105. Ferromagnetismus. (Ferromagnetism.) Richard Becker. "Physics of Solids" *(Office of Military Government for Germany)*, Part II, p. 27-42.

German contributions during 1939-46. Deals mainly with theory. 23 ref.

3A-106. Elektrizitätsleitung in Metallen. (Conduction of Electricity in Metals.) Gerhard Hettner. "Physics of Solids" *(Office of Military Government for Germany)*, Part II, p. 123-130.

German contributions during 1939-46 on theory, experimental methods, and new data. 47 ref.

3A-107. High-Temperature Properties of Rotor Disks for Gas Turbines as Affected by Variables in Processing. J. W. Freeman, Howard C. Cross, E. E. Reynolds, and Ward F. Simmons. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 555-588; discussion, p. 589-590.

Previously abstracted from Advance Reprint. See item 3A-52, 1949. 14 ref.

3A-108. An Experimental Study of the Influence of Various Factors on the Mode of Fracture of Metals. P. G. Jones and W. J. Worley. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 648-662; discussion, p. 663.

Previously abstracted from preprint. See item 3a-56, 1948.

3A-109. Dynamic Torsion of Metals and Alloys Used in Aircraft Construction. Part III. Their Elastic Limit and Micro-Plastic Deformation Under Reversed Torsional Energy Loads. (Concluded.) Georges Welter. *Metallurgia,* v. 39, Apr. 1949, p. 313-315.

Data obtained by use of the special test apparatus described in the previous installments, including results for monel, tabulated in comparison with duralumin, a Mg alloy, and two steels. The Bauschinger effect is quite large for most materials.

3A-110. (Book) **Physik der Festen Körper.** (Physics of Solids.) Parts I and II. Georg Joos, editor. 228 and 235 pages. 1947 and 1948. Office of Military Government for Germany. (FIAT Review of German Science, 1939-1946.)

Part of a series prepared by German authors. General, metallic, and nonmetallic phases are covered. Largely a review of German literature for 1939-1946. Individual articles are abstracted separately.

3A-111. (Book) **Leitfähigkeit und Leitungsmechanismus fester Stoffe.** (Conductivity and the Conduction Mechanism in Solid Materials.) Eduard Justi. 348 pages. 1948. Vandenhoek und Ruprecht, Göttingen, Germany. 15 DM.

Presents the views of modern physics on this subject by discussing conductivity in terms of moving electrons and reviewing all other phenomena through which the dynamics of electrons in crystals are accessible to observation, such as the Hall effect, thermoelectricity, superconductivity, rectification in surface layers, semiconductors, photoconductivity, ionic conductivity of crystals, etc. A review of experimental work. Theories are not presented in full, but theoretical results are freely quoted. There is an elementary introduction to the wave mechanics of electrons in metals. (From review in *Nature.)*

3A-112. The Interpretation of the Theory of Superconductivity. M. von Laue. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 90-93; discussion, p. 127-128

A theoretical discussion.

3A-113. Size Effects in Superconductivity. D. Shoenberg. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 93-101; discussion, p. 127-128.

Three different parameters, each having the dimensions of a small length, are involved in superconductivity; whenever the specimen size becomes comparable to one of these lengths, characteristic departures from the properties of the bulk metal occur. Present state of knowledge about these effects and experimental work on them in the Mond Laboratory, Cambridge. 15 ref.

3A-114. Nuclear Ferromagnetism. H. Fröhlich and F. R. N. Nabarro. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 129-134.

At sufficiently low temperatures metals become ferromagnetic owing to an orientation of the nuclear spins. The domain structure of such

ferromagnetics is analogous to that of ordinary ferromagnetics.

3A-115. Transmission of Elastic Pulses in Metal Rods. D. S. Hughes, W. L. Pondrom, and R. L. Mims. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1552-1556.

Pulses are generated at one end of a cylindrical rod by a quartz crystal. A second crystal at the opposite end acts as a detector. Transmission time is studied as a function of rod length, diameter, and material. Block diagram of apparatus, pulse diagrams, and tables. Rotational and dilatational velocities can be computed and hence elastic constants of material.

3A-116. Measurement of the Internal Friction of Solids. R. Kamel. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1606.

Internal friction of a number of metallic solids and glass was determined from transverse vibrations. Two methods were employed: decay of free lateral vibrations and width of resonance.

3A-117. Weiterentwicklung der Festigkeitsrechnung bei Wechselbeanspruchung. (Further Development of the Calculation of Stress Under Alternating Stresses.) Erich Siebel and Max Pfender. *Stahl und Eisen,* v. 66-67, Sept. 11, 1947, p. 318-321.

Calculation of fatigue strength of materials subjected to different types of stress under different conditions. Theory of fatigue strength under alternating stresses.

3A-118. Betrachtungen uber den Elastizitätsmodul der Metalle und Legierungen. (Observations on the Modulus of Elasticity of Metals and Alloys.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 145-158.

Data on modulus of elasticity of all of the metals were correlated in relation to position in the periodic table, thermoelastic properties, and temperature. Conditions that affect the modulus of continuous and limited solid-solution series of alloys and intermetallic compounds. 37 ref.

3A-119. Studies on Fly-Ash Erosion. M. A. Fisher and E. F. Davis. *Mechanical Engineering,* v. 71, June 1949, p. 481-487.

Previously abstracted from *American Society of Mechanical Engineers,* item 3A-31, 1949.

3A-120. Reactions of Metals in High Vacua. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of Physical & Colloid Chemistry,* v. 53, May, 1949, p. 690-711.

Previously abstracted from "Pittsburgh International Conference on Surface Reactions", item 3A-42, 1949.

3A-121. German Work on the Physics of Solids. A. M. Adams and A. J. Sandor. *British Coal Utilisation Research Association, Monthly Bulletin,* v. 13, Mar. 1949, p. 73-84.

A review based on the contents of Vol. I of a recently abstracted book: "Physik der Festen Korper", Georg Joos, editor, which is one of a series of FIAT reviews of German science being issued by the Office of Military Government for Germany. Selected passages are translated, together with comments on parallel advances in Allied countries. Subjects covered are structure, mechanical and thermal properties, and diffusion. Only the more important references from the original book are included, but 23 additional ones have been added. 129 ref.

3A-122. Some New Aspects of the Strength of Alloys. George-Maria Schwab. *Transactions of the Faraday Society,* v. 45, Apr. 1949, p. 385-396.

Temperature coefficient of the Brinell hardness of metals can be represented by a bi-exponential formula, leading to the assumption of two different processes with different activation energies, of which the larger one is connected with the formation of new perturbation centers. The Brinell hardnesses of the phases of the Hume-Rothery systems Cu-Zn, Cu-Sn, Ag-Zn, and Ag-Cd were measured between 20 and 450° C. in a special apparatus and evaluated according to the above theory. 22 ref.

3A-123. Repartition des charges dans les cables Aluminium-Acier; coefficient de dilatation lineaire et module d'elasticite. (Distribution of Loads in Aluminum-Steel Cables; Coefficient of Linear Expansion and Modulus of Elasticity.) Pierre Chapoulie. *Revue de l'Aluminium,* v. 26, Apr. 1949, p. 115-122.

Method for calculation of mechanical properties of Al-Fe cables is based on assumption of uniform behavior (that is, as if the conductor were homogeneous). Doubts have been expressed as to the validity of this assumption. Results of experiments over a wide range of conditions showing that mechanical characteristics are influenced by temperature and that the variations are too important to be ignored.

3A-124. Influence des fluctuations thermiques sur l'aimantation de grains ferromagnetiques tres fins. (Influence of Thermal Fluctuations on the Magnetization of Very Fine Ferromagnetic Particles.) Louis Néel, *Comptes Rendus,* v. 228, Feb. 21, 1949, p. 664-666.

A theoretical, mathematical analysis.

3A-125. Relations entre les perturbations du reseau metallique et la durete due a l'ecrouissage. (Relations Between Deformations in Metallic Systems and Hardness Caused by Cold Working.) W. Boas. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 84-88; discussion, p. 88.

Critically analyzes existing data, mostly obtained by X-ray methods. On the basis of this analysis, a new interpretation of the relationship is proposed. 39 ref.

3A-126. Pyrophoric Metals. (In Russian.) D. A. Pospekhov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 5-12.

A number of metals which have been obtained in the pyrophoric state. On the basis of theory, conversion of Al, Ge, Hf, Cb, Ta, Mo, and Re to the pyrophoric state seems possible. The nature of pyrophoric metals has been investigated but little, particularly the connection between pyrophoric and catalytic properties. 129 ref.

3A-127. The Theory of Electrical Conductivity of Monovalent Metals. (In Russian.) F. G. Serova. *Zhurnal Eksperimental 'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Feb. 1949, p. 126-134.

Analyzes Bardin's theory. Results of experiments indicate that, for lithium, theoretical data are in much better correspondence with experimental data during use of the wave functions of electron conductivity than during use of plane waves. A new formula is proposed for calculation of the above. Determinations for Li, Na, and K indicate validity of the formula.

3A-128. Theory of Surface Tension of Metals. (In Russian.) A. E. Glauberman. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, Feb. 1949, p. 115-123.

Value of the surface tension of a metal is determined by the excess potential energy of surface particles, which is in full accord with Frenkel's theory. Data obtained by using the proposed equations agree completely with experimental results.

3A-129. Mechanics of Rough Elastic-Plastic Bodies. I. Generalized Equation of Motion. II. Shear. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 34-61.

Theoretical, mathematical analyses. Equations are derived and interpreted for different values of the variables. 15 ref.

3A-130. Magnetic Structure of Highly Coercive Alloys. I. Certain Peculiarities of the Curves of Magnetization and the Hysteresis Loop of the Highly Coercive Alloys Alnico and Vicalloy. L. A. Shubina and Ya. S. Shur. **II. Influence of Thermomagnetic Treatment on Electrical Resistance of the Highly Coercive Alloy, Alnico.** (In Russian.) V. I. Drozhzhina, M. G. Duzhinskaya, and Ya. S. Shur. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 88-97.

Data confirming the hypothesis of the authors concerning the magnetic structure of the above alloys. The "Alnico" investigated contained 51% Fe, 24% Co, 8% Al, and 3% Cu· the "Vicalloy", 52% Co, 38% Fe, and 10% V.

3A-131. Resistance to Deformation During Plastic Flow of Polycrystalline Metals. (In Russian.) P. O. Pashkov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 251-270.

The possibility of formulating a single criterion for strength of polycrystalline metals under marked plastic deformation. Bibliographic data and the author's experiments confirm the acceptability of the proposed criterion. 17 ref.

3A-132. Uniformity of Conditions of Strength and Plasticity. (In Russian.) G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 471-474.

Analyzes the above, taking into consideration the resistance of metals to fracture under conditions of elastic deformation, a factor not considered in contemporary theories of strength of materials.

3A-133. Kann ein Metall bei der plastischen Deformation vorubergehend schmelzen? (Can Plastic Deformation Cause a Metal to Melt Temporarily?) Georg Masing. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 89-93.

Critical examination of earlier propositions by Poynting, Johnston,

and Niggli indicates that the answer to the above question is in the negative. 13 ref.

3A-134. Medidas Eficientes da Dutilidade e Capacidade de Deformacao de Metais. (Effective Determination of Ductility and Deformation Capacity of Metals.) Werner Grundig. *Boletin da Associacao Brasileira de Metais,* v. 5, Jan. 1949, p. 68-91.

Modern methods. Factors involved, such as chemical composition, crystal structure, method of production, heat treatment, cold working, and their influence on ductility and deformation capacity. 13 ref.

3A-135. (Book) **Metallurgy and Magnetism.** J. K. Stanley. 150 pages. American Society for Metals, . 7301 Euclid Ave., Cleveland, Ohio. $4.00.

An introductory text on ferromagnetism and types of magnetic materials. Magnetic theory, factors affecting magnetic properties, methods of using various magnetic properties to study metallurgical and solid-state problems.

3A-136. (Book) **Properties of Metals in Materials Engineering.** 177 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

Eight educational lectures presented at 30th National Metal Congress and Exposition of A.S.M., Philadelphia, Oct. 23-29, 1948. Fundamental concepts, behavior under direct or nonreversed loading, application of fatigue data to machine design, determination of state of stress, analysis of stress in aircraft engines, testing to specific deflections, and design for energy absorption. 68 ref.

3A-137. The Influence of Fluctuations in Stress Amplitude on the Fatigue of Metals. T. J. Dolan, F. E. Richart, Jr., and C. E. Work. *American Society for Testing Materials,* Preprint 32, 1949, 34 pages.

Results obtained by investigation of fatigue life of metals subjected to repeated stresses fluctuating between two different amplitudes. Small high-speed rotating cantilever-beam fatigue-testing machines were used to test notched or unnotched specimens of three steels and of 75S-T Al alloy. Results shed light on the mechanism of fatigue failure.

3A-138. A Theory of Reflectivity and Emissivity. D. J. Price. *Proceedings of the Physical Society,* v. 62, sec. A, May 1, 1949, p. 278-283.

General theory applies to the Drude-Zener treatment of the optical properties of an ideal metal containing perfectly free electrons only. Disagreement with experimental observations indicates that the Drude-Zener treatment must be modified.

3A-139. The Weiss-Heisenberg Theory of Ferromagnetism and a New Rule Concerning Magnetostriction and Magneto-Resistance. J. L. Snoek. *Nature,* v. 163, May 28, 1949, p. 837-838.

Speculations indicating possibility of a new theory on the basis of a consideration of the properties of ranges of alloys in which the mean number of Bohr magnetons passes through an integral value.

3A-140. New Alloy Possesses High Electrical Resistivity. *Steel,* v. 124, June 20, 1949, p. 129.

Properties of alloy which has a specific resistance at 20° C. of 800 ohms per circular mil foot. Composition is not indicated.

3A-141. The Surface Photoelectric Effect. R. E. B. Makinson. *Physical Review,* ser. 2, v. 75, June 15, 1949, p. 1908-1911.

An expression for the photo-electric current produced at the surface of a metal. Validity of the assumption that the current from conduction electrons of a particular momentum can be expressed as the product of an excitation function and a transmission coefficient. Production in the photo-electric current of beat frequencies between spectral lines.

3A-142. Evidence for a Change in the Nature of Work Hardening at Small Strains. J. S. Koehler and T. H. Blewitt. *Physical Review,* ser. 2, v. 75, June 15, 1949, p. 1952-1953.

Based on the literature. Certain unanswered questions are raised.

3A-143. The Significance of the Criterion for Additional Plastic Deformation of Metals. D. C. Drucker. *Journal of Colloid Science,* v. 4, June 1949, p. 299-311.

The work of Mises and Prager is extended within the framework of present theories. Consideration is given to the simplest theories and to general types without time effects in which the loading criterion involves strain as well as stress and the path of loading has influence.

3A-144. Fracture of Ductile Metals. John E. Dorn. *Iron Age,* v. 164, July 7, 1949, p. 90-95, 100.

Influence of temperature, strain, and combined stresses, on fracturing. Emphasizes need for more comprehensive data on rate of growth of microcracks. 20 ref.

3A-145. A Reconsideration of Deformation Theories of Plasticity. D. C. Drucker. *Transactions of the American Society of Mechanical Engineers,* v. 71, July 1949, p. 587-590; discussion, p. 590-592.

Previously abstracted from *American Society of Mechanical Engineers,* Paper No. 48-A-81, 1948. See item 24A-15, 1949.

3A-146. Influence des fluctuations thermiques sur l'aimantation des substances ferromagnétiques massives. (Influence of Thermal Fluctuations on the Magnetization of Massive Ferromagnetic Substances.) Louis Néel. *Comptes Rendus* (France), v. 228, Apr. 4, 1949, p. 1210-1212.

A theoretical, mathematical analysis.

3A-147. Theories of Plastic Buckling. S. B. Batdorf. *Journal of the Aeronautical Sciences,* v. 16, July 1949, p. 405-408.

A new theory of plasticity which is of neither the flow nor the deformation type. It is based upon the concept of slip, and its formulation was guided more by physical, and less by mathematical, considerations than previous theories. Experimental evidence of limited scope is in better agreement with the new theory than with either flow or deformation theories. 15 ref.

3A-148. (Book) **Thermochemie der Legierungen.** (Thermochemistry of the Alloys.) Friedrich Weibke and Oswald Kubaschewski. 357 pages. 1943. Springer-Verlag, Berlin, Germany. (Reproduced 1948 by J. W. Edwards, Ann Arbor, Mich.)

Part I discusses basic methods for determining formation of alloys and the possibility of evaluating their e.m.f.'s and vapor pressures in thermodynamic terms. Part II summarizes information on heats of formation, solution, transformation, and fusion of 244 alloys; Part III discusses the correlation between the heats of fusion, and other characteristics related to the formation of alloys; and Part IV briefly outlines the metallurgical importance of thermochemical data.

3A-149. Elastische Eigenschaften. (Elastic Properties.) W. Köster. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 41-47.

German literature on elastic properties of metals for 1939-46 not covered in the FIAT Review, "Physik der Festen Korper". Main topics are: temperature and concentration variations of modulus of elasticity; influence of mechanical and thermal treatment and of ferromagnetic state on modulus of elasticity; measurements on single crystals; general observations; and determination of modulus of elasticity. 26 ref.

3A-150. Inwendige demping bij metalen. (Internal Friction in Metals.) H. C. den Daas. *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Mar. 1949, p. 5-9.

Various physical origins of internal friction, as far as known at present. The sources are classified as diffusion and viscosity effects.

3A-151. Plastische vervorming van kristallen volgens de opvatting van Taylor. (Plastic Deformation of Crystals According to Taylor's Theory.) N. A. Brunt. *Metalen,* v. 3, Apr. 1949, p. 169-175.

Theory of dislocations. The generation and movement of dislocations under the influence of the stress field and the possibility for explaining the work hardening in metals, by this theory. Finally, the more general treatment of the problem, as published by J. M. Burgers, is mentioned.

3A-152. Untersuchungen an verschiedenen pauschal unmagnetischen Zuständen. (Investigations on Different Completely Nonmagnetic States.) Hermann Fahlenbrach and Klaus Sixtus. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 187-193.

Measurements on different materials showed that the initial permeability of samples reduced by demagnetization to the totally nonmagnetic state is decreased by vibration. This effect was observed for variously treated alloys of Fe with Ni, Si, or Al; and for pure Ni. 17 ref.

3A-153. Study of the Plasticity of Sheet Materials. Ya. B. Fridman and A. A. Bat. *Metallurgia,* v. 40, June 1949, p. 121. Translated and condensed from *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1462-1469.

Previously abstracted from original, item 3A-79, 1949.

3A-154. Dislocations as a Cause of Mechanical Damping in Metals. J. D. Eshelby. *Proceedings of the Royal Society,* ser. A, v. 197, June 22, 1949, p. 396-416.

A theoretical discussion of thermoelastic effects due to stationary and moving dislocations. Need for further theoretical and experimental study. 18 ref.

3A-155. Fatigue and Mechanical Properties. Is there a Relation Between Them? Francis G. Tatnall. *Western*

Machinery and Steel World, v. 40, July 1949, p. 88-89, 100.

Concludes that there is probably no definite relationship between the two types of properties. Steps for study of effective strength of structures in service.

3A-156. Tests of Insect Wire Screening. H. W. Burney and H. B. Williams. *Journal of Southern Research,* v. 1, July 1949, p. 4-8.

Data on nine types (light metallic and one plastic). The following tests were made: tensile strength, steady-load deflection; impact load; bend resistance; abrasion resistance; expansion and contraction; and passage of light and air.

3A-157. Problems of the "Wettability" of Metals and Bearing Alloys. (In Russian.) M. E. Drits. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences) Mar. 1949, p. 426-429.

The edge angle of wetting depends on the chemical composition of the metal, the condition of the surface, the viscosity of the oil, the time, and the temperature.

3A-158. Concerning Application of a Theory of Disorder to Polar Models of Metals. (In Russian.) N. N. Bogolyubov and S. V. Tyablikov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics) v. 19, Mar. 1949, p. 251-255.

A theoretical, mathematical analysis.

3A-159. Approximate Method of Determination of Low-Energy Levels of Electrons in Metals. (In Russian.) N. N. Bogolyubov and S. V. Tyablikov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Mar. 1949, p. 256-268.

An approximate secondary quantum method for determination of the energy spectrum of low states of excitation. Results are illustrated in connection with the theory of ferromagnetism.

3A-160. Generalization of the Statistical Theory of Toughness for the Case of Non-Uniformly Stressed States. (In Russian.) T. A. Kontorova and O. A. Timoshenko. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 355-370.

Mathematical treatment of problem which attempts to generalize the statistical theory previously proposed.

3A-161. Variations in the Mechanical Properties of Metals Under Hydrostatic Pressure. (In Russian.) S. I. Ratner. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 408-411.

Investigated for Cu, Mg and Mg alloys, Be bronze, a cast Al alloy, and Si-Cu-Mg-Zr alloys. Under the influence of hydrostatic pressure, not only tensile strength and yield point, but also resistance to plastic deformation are altered. The amount of the change is related to the structure of the metal.

3A-162. Experimental Confirmation of the Basic Laws of the Theory of Plasticity. (In Russian.) S. T. Kishkin and S. I. Ratner. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 412-420.

Attempts to verify experimentally the condition of plasticity of St. Venant and Huber-Mises. It is shown that, in the general case, these conditions are not valid; and are correct only in particular cases. Results of experiments on a series of ferrous and nonferrous metals and alloys.

3A-163. The High Frequency Skin Resistance of Metals at Low Temperatures. (In English.) A. B. Pippard. *Physica,* v. 15, Apr. 1949, p. 45-54.

Theoretical analysis and experimental results obtained on a number of metals, both superconducting and normal, at temperatures down to 4° K. or lower.

3A-164. Superconductivity. (In English.) C. J. Gorter. *Physica,* v. 15, Apr. 1949, p. 55-64.

Developments since 1934, indicating problems yet to be solved. 29 ref.

3A-165. The Casimir Method of Studying Penetration Depths in Superconductors. (In English.) D. Shoenberg. *Physica,* v. 15, Apr. 1949, p. 71-75.

Results of experimental and theoretical analysis. Errors are shown to be likely to be over rather than underestimates. A method described by Shalnikov and Sharirn. (Moscow, 1948.)

3A-166. Sur des courants normaux a la fois aux gradients de potential et de température. (Concerning Currents Normal to the Time of Potential and Temperature Gradients.) Albert Perrier. *Physica,* v. 15, Apr. 1949, p. 76-79.

Effects predicted and subsequently observed by the author several years ago. A brief qualitative description and a summary of quantitative characteristics determined for iron and nickel. Theoretical bases.

3A-167. Relaxation Phenomena in Metals. (In English.) Clarence Zener.

Physica, v. 15, Apr. 1949, p. 111-118; discussion p. 118.

Information obtained from a study of mechanical relaxation, and current metallurgical problems which may be aided by further study of mechanical relaxation.

3A-168. Mechanical Properties of Metals. (In English.) N. F. Mott. *Physica*, v. 15, Apr. 1949, p. 119-128; discussion p. 129-133.

Mechanism of slip in crystals or crystalline grains, physical causes of hardness, grain-boundary slip, recovery, and recrystallization. 16 ref.

3A-169. The Present Status of the Theory of Ferromagnetism. (In English.) J. H. Van Vleck. *Physica*, v. 15, Apr. 1949, p. 197-205; discussion p. 205-206.

18 references.

3A-170. Ferromagnetic Domains. (In English.) R. M. Bozorth. *Physica*, v. 15, Apr. 1949, p. 207-219.

Recent theoretical and experimental work at Bell Telephone Laboratories. Forces to be considered in analysis of domain structures. These are: crystal anisotropy; Bloch wall; action of magnetic field; surface charge of magnetization; and strain anisotropy. Domain rotation, domain geometry in low and medium fields, and domain wall displacements. Curves for various magnetic properties of a 3.8%-Si iron and of an 89%-Ni Permalloy. Powder patterns of areas subjected to mechanical and electrolytic polishing. 14 ref.

3A-171. A Quantitative Examination of Recent Ideas on Domain Structure. (In English.) L. F. Bates and F. E. Neale. *Physica*, v. 15, Apr. 1949, p. 220-224.

Some experimental results obtained during a study of Bitter figures. A thin strip of 2.8%-Si iron was used. Variation of the width of a domain pair with applied field. Line deposits produced by a magnetic-powder technique.

3A-172. Nouvelle theorie du champ coercitif. (A New Theory of the Coercive Field.) Louis Néel. *Physica*, v. 15, Apr. 1949, p. 225-233; discussion p. 233-234.

Attributes coercive field to the influence of fields of dispersion due to nonuniformity of spontaneous magnetization resulting from the presence of vacancies or of inclusions, or to the influence of specific directions of magnetization produced by internal tensions. Mathematical elaboration of the proposed theory.

3A-173. The Cause of Anisotropy in Permanent Magnet Alloys. (In English.) K. Hoselitz and M. McCaig. *Physica*, v. 15, Apr. 1949, p. 241-243.

Previously abstracted from *Proceedings of the Physical Society*, item 3A-83, 1949.

3A-174. Time-Effects in Ferromagnetism. (In English.) J. L. Snoek. *Physica*, v. 15, Apr. 1949, p. 244-251.

Attempts systematic survey of the phenomena dividing them into ionic and electronic time-effects.

3A-175. On the Theory of Ferromagnetic Resonance. (In English.) D. Polder. *Physica*, v. 15, Apr. 1949, p. 253-255.

Mathematical analysis.

3A-176. On the Gorter Normal Field Ferromagnetic Resonance Experiment. (In English.) C. Kittel, W. A. Yager, and F. R. Merritt. *Physica*, v. 15, Apr. 1949, p. 256-257.

Gorter suggested in 1947 that it would be of interest to carry out the ferromagnetic-resonance experiment with the static magnetic field normal to the plane of the specimen. Such an experiment was performed at a frequency of 23,970 mc. per sec. using an annealed Supermalloy specimen.

3A-177. Ferromagnetic Resonance in Crystal Fields. (In English.) R. Kronig. *Physica*, v. 15, Apr. 1949, p. 264-265.

Interprets results of A. Wieberdink (*Nature*, v. 162, 1948, p. 527) with respect to difference of wave length on lines with a Cu and an Fe-Ni central wire, respectively.

3A-178. Frottement interieur par ferromagnetisme. (Internal Friction Caused by Ferromagnetism.) Ch. Boulanger. *Physica*, v. 15, Apr. 1949, p. 266-271.

The above was investigated for Armco iron, nickel, ferromagnetic metals, Ni-Cr-Mo steel, and a hypereutectoid steel. Method of investigation and results.

3A-179. Displacement of the Curie Point of Ferromagnetic Alloys under the Influence of Tensile Stress. (In Russian.) K. P. Belov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics) v. 19, Apr. 1949, p. 346-352.

Investigated for Fe-Ni, Fe-Pt, Fe-Ni-Cr, and Fe-Ni-Co. The earth's magnetism could not be explained by the "ferromagnetism" of the earth's core, because Fe, Ni, and Fe-Ni alloys should undergo a decrease of Curie point under high pressures. 11 ref.

3A-180. Character of Curves of Composition Vs. Properties of Metallurgical Solid Solutions at High Temperatures. (In Russian.) A. M. Borzdyka.

Doklady Akademii Nauk SSSR (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 1, 1949, p. 505-507.

Investigated by the analysis of isotherms of specific electrical resistance (0-1000° C.) of the Fe-Ni and Fe-Cr-Ni systems. Results indicate that the "classical" scheme for the variation of the properties of solid solutions with composition is valid only in the range from room up to moderately high temperatures.

3A-181. Relationship Between Elongation and Shear Under Different Types of Deformation. (In Russian.) V. G. Osipov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 580-582; discussion p. 583.

Mathematical relationship proposed by Davidenkov for values of elongation and shear, under different types of elongation. A slight error in derivation of the formula is indicated. Discussion consists of a clarification by Davidenkov.

3A-182. Relation Between Residual Strain Energy and Elastic Moduli. (In English.) Clarence Zener. *Acta Crystallographica,* v. 2, June 1949, p. 163-166.

Presence of residual strain energy necessarily results in a lowering of the over-all tensile and shear moduli. A quantitative relation is derived between density of residual strain energy and decrease in tensile and shear moduli. Interprets recent observations of Köster that solute atoms of only a small solubility lower the tensile modulus when they are atomically dispersed.

3A-183. Interchange Interaction and Collective Electron Ferromagnetism. E. P. Wohlfarth. *Philosophical Magazine,* ser. 7 v. 40, July 1949, p. 703-717.

Theoretical mathematical discussion of the relationship between electron interchange interaction and the ferromagnetic properties of metals. 17 ref.

3A-184. Graphical Analysis of Impact of Bars Stressed Above the Elastic Range. Parts I and II. Kalman J. DeJuhasz. *Journal of the Franklin Institute,* v. 248, July 1949, p. 15-48; Aug. 1949, p. 113-142.

The history and gradient of stress and of velocity are represented in three-dimensional diagrams. Energy expended in impact, and its distribution into energy of plastic deformation, and into residual kinetic and elastic stress energy, as well as total residual permanent strain are determined. Numerical examples. Part II deals with impact in the stress range above the elastic limit and includes 43 abstracts from the literature.

3A-185. The Phenomenon of Anisotropy in Annealed Polycrystalline Metals. A. Krupkowski and S. Kawinski. *Journal of the Institute of Metals,* v. 75, July 1949, p. 869-880.

The conception of coefficients of partial uniform elongation is introduced, the value of which may be easily calculated from elongation measurement on a fractured flat metal testpiece. Relationship of these coefficients is the coefficient of anisotropy for polycrystalline metals. Some annealed metals, such as mild steel, brass, and aluminum, after a previous cold working, show a distinct tendency toward anisotropy.

3A-186. Strength of Alloys at High Temperature. K. A. Osipov. *Metal Progress,* v. 56, Aug. 1949, p. 262, 266, 268, 270, 272.

Based on three papers in *Doklady Akademii Nauk SSSR*. See items 3a-113 and 3a-114, 1948; 3A-29, 1949.

3A-187. Contribution a l'étude du frottement intérieur. (Contribution to the Study of Internal Friction.) Christian Boulanger. *Revue de Métallurgie,* v. 46, Apr. 1949, p. 255-265.

Extensive review of the literature. Experimental work done to be described in subsequent installments. (To be continued.)

3A-188. Die Schadenslinie bei Dauerstandbeanspruchung. (The Damage Range in Creep Stressing.) August Thum and Kurt Richard. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 229-242.

Fracture is initiated by very small but gradually increasing damages to the structure of the metal, which can partly be corrected by heat treating. A distinction is made between micro and macro-damages. Effects of chemical composition, heat treatment, testing temperature, and passage of time on distortion caused by slip or plastic deformation. Practical suggestions for periodic inspection of large structures for avoidance of failure. 37 ref.

3A-189. High Temperature Characteristics of Heat Resistant Alloys. Norman S. Mott. *Product Engineering,* v. 20, Sept. 1949, p. 163.

Data sheet.

3A-190. Fatigue. P. S. Wakefield. *Machinery Lloyd* (Overseas Edition), v. 21, Aug. 13, 1949, p. 68-72.

General discussion of fatigue especially as applied to metallic materials of construction. Diagrams illustrate the four types of stress cycles most frequently encountered. Effects of notches and other stress raisers, and of corrosion.

3A-191. The Effect of Impurities on the Properties of Metals. C. H. Desch. *Bulletin of the Institution of Mining and Metallurgy,* Aug. 1949, p. 17-28; discussion, p. 28-30.

Also methods for removal of impurities from various metals.

3A-192. Brinell Hardness as a Function of the Parameters of Plasticity of Metals. (In Russian.) G. P. Zaitsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 704-717.

The relation between constants specific for ball impression and the corresponding constants under tensile stress, i. e., yield strength and elongation, were theoretically investigated. Brinell hardness and conditional stress were also found to be interrelated. Equations of dependence are derived on the basis of theoretical considerations. Experimental and theoretical data.

3A-193. Contribution à l'étude du frottement intérieur. (Contribution to the Study of Internal Friction.) Christian Boulanger. *Revue de Métallurgie,* v. 46, May 1949, p. 321-342.

Concludes extensive descriptive review of the literature, including experimental methods and apparatus and reproduction of the more important experimental results. 156 ref.

3A-194. Intéret des mesures magnétiques dans la détermination de la constitution des alliages dia et paramagnétiques. (Importance of Magnetic Measurements in Determination of the Constituents of Diamagnetic and Paramagnetic Alloys.) F. Mahn. *Revue de Métallurgie,* v. 46, June 1949, p. 363-364; discussion, p. 364.

Variation of coefficient of magnetization with composition was investigated. It was found that the coefficient does not depend on the temperature in the case of diamagnetic alloys. However, for paramagnetic alloys the coefficient is dependent on temperature and on Curie point, in accordance with Weiss's law. 14 ref.

3A-195. Fortschriffe auf dem Gebiet der magnetischen Werkstoffe. (Advances in the Field of Magnetic Materials.) Franz Pawlek. *Metall,* July 1949, p. 211-215.

Reviews literature published since 1937. 65 ref.

3A-196. Stress-Strain Relations. J. H. Palm. *Metal Progress,* v. 56, Sept. 1949, p. 358.

Reply to M. G. Corson's abstract and criticism of the author's paper on "Stress-Strain Relations for Uni-Axial Loading".

3A-197. On the Extrapolation of Short-Time Stress-Rupture Data. Nicholas J. Grant and Albert G. Bucklin. *American Society for Metals,* Preprint No. 18, 1949, 33 pages.

A large number of stress-rupture tests was made on alloy S-590 at 1200-1900° F. and on S-816 at 1200-1500° F. Rupture times varied from 3 sec. to 26,000 hr. The validity of straight lines in the log-log and semi-log plots of stress vs. rupture time and of stress vs. minimum creep rate is examined on the basis of these tests. Suggests method for predicting long-time performance or performance at other temperatures based on extrapolation of instability points clearly shown in log-log plots of rupture data. Data are analyzed on the basis of the chemical rate process theory. A value of "true elongation" is determined from stress-rupture tests, which appears to establish ductility changes as a function of increasing time or decreasing strain rate at a given temperature.

3A-198. The Behaviour of Metals Under Multiaxial Stress Systems. A. E. Johnson. *Aircraft Engineering,* v. 21, Sept. 1949, p. 284-286.

Mathematical analysis of the relationship between the applied tensile or direct stress and the torsion or shear stress.

3A-199. On the Gyromagnetic Ratio and Spectroscopic Splitting Factor of Ferromagnetic Substances. Charles Kittel. *Physical Review,* ser. 2, v. 76, Sept. 15, 1949, p. 743-748.

Discusses the connection between the results of microwave resonance-absorption experiments and gyromagnetic-ratio experiments. Review of experimental data indicates considerable variances between the two methods. 26 ref.

3A-200. Temperature and Metals. Notes on the Effect of Temperature on Certain Properties of Metals with Particular Reference to Creep. (Continued.) F. C. Lea. *Edgar Allen News,* v. 28, Aug. 1949, p. 354-356.

3A-201. On Grüneisen's Constant for Metals. Al Kónya. *Journal of Chemical Physics,* v. 17, Sept. 1949, p. 836.

Based on the theory developed by P. Gombás, an equation for theoretical determination of the above constant is developed. Compares experimental and theoretical data for Na, K, Rb, Cs, Mg, Ca, Sr, and Ba.

3A-202. Reviews of Certain Aspects of Metal Physics. Part III. The Principal Work in Ferromagnetism Since About 1938. W. Sucksmith. *Journal of the Iron and Steel Institute,* v. 163, Sept. 1949, p. 51-60.

One of a series of critical surveys. 105 ref.

3A-203. Contribution to the Theory of Alloys. (In Russian.) N. S. Akulov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 21, 1949, p. 361-364.

A mathematical analysis with particular emphasis on the relationship of the properties of each atom of the crystal to the number and characteristics of the surrounding atoms. This relationship corresponds to that of the magnetic saturation of alloys to the concentration of alloy components.

3A-204. Addendum: Heat Flow in Metals Below 1° K. and a New Method for Magnetic Cooling. J. G. Daunt and C. V. Heer. *Physical Review,* v. 76, Oct. 1, 1949, p. 985-986.

Heat pump for transferring heat from bath maintained at below 1° K. to a high-temperature bath, say 1° K.

3A-205. Deltamax: "The Metal With a Brain". W. S. Spring. *Steel Horizons,* v. 11, Fall 1949, p. 16-18.

See abstract from *Iron Age,* item 3A-77, 1949.

3A-206. Reduktion der Thermokräfte auf ideale Reinheit der Metalle. (Derivation of Thermal Electromotive Forces for "Completely" Pure Metals.) Max Kohler. *Zeitschrift für Physik,* v. 126, July 15, 1949, p. 481-494.

A formula for calculating the effects of impurities in a metal on thermoelectric forces, thus making it possible to determine constants for "completely" pure metal. Analogous conditions for the Thomson and Peltier effect, and general statements on the temperature dependence of thermoelectric phenomena and a comparison of computed with experimental results. 24 ref.

3A-207. Magnetische Legierungen hoher Permeabilitätskonstanz. (Magnetic Alloys of High Permeability Constancy.) K. Sixtus. *Physikalische Blätter,* v. 5, no. 2, 1949, p. 64-66.

The importance of above in a.c. circuits and composition and treatment of a low-Ni alloy which is an effective substitute for more expensive high-Ni alloys.

3A-208. Berechnung der Verformungsarbeit von Metallen bei gewöhnlicher und schlagartiger Zugbeanspruchung. (Computing the Stress of Deformation of Metals Under Usual and Impact-Type Tensile Stresses.) Albert Kochendörfer. *Zeitschrift für Metallkunde,* v. 39, Dec. 1948, p. 376-384.

The true stress-strain curve for face-centered metals and for body-centered ferrous metals is approximated by a parabola. The dependence of expansion-curve indices on temperature and rate of stress application. Method of computing deformation stresses is demonstrated and theoretical results are compared with experimental ones. 16 ref.

3A-209. Magnetic Characteristics of an Oriented 50 Percent Nickel-Iron Alloy. J. H. Crede and J. P. Martin. *Journal of Applied Physics,* v. 20, Oct. 1949, p. 966-971.

Single-crystal magnetic properties were closely approached in a polycrystalline 50% Ni-Fe alloy by development of a favorable grain orientation. The method is adapted to commercial production by careful control of processes affecting the fundamental magnetization process. Hysteresis loops of nearly geometrically true rectangular shape were produced.

3A-210. Fretting Fatigue. Literature Report No. 1. George Sachs. *Journal of Scientific & Industrial Research,* v. 8, Aug. 1949, p. 329-333.

Literature survey. 57 ref.

3A-211. Magnetic Dispersion at Microwave Frequencies. G. F. Hodsman, G. Eichholz, and R. Millership. *Proceedings of the Physical Society,* v. 62, sec. B, June 1, 1949, p. 377-390.

Method for measurement of initial permeabilities of ferromagnetic wires in the microwave region, and successfully applied from 3-13 cm. wavelength to a variety of materials. Results are interpreted in the light of modern theories of magnetic dispersion. An estimate of domain sizes is made. 24 ref.

3A-212. The Magnetostriction of Anisotropic Permanent Magnet Alloys. M. McCaig. *Proceedings of the Physical Society,* v. 62, sec. B, Oct. 1, 1949, p. 652-656.

Blocks of permanent magnet alloys of the system Fe-Ni-Al-Co-Cu were prepared with columnar crystals. Magnetostriction was measured in various directions before and after heat treatment in a magnetic field. Results agree well with those predicted theoretically, and thus confirm the postulated crystal structure.

3A-213. Temperature and Metals. (Concluded.) *Edgar Allen News,* v. 28, Sept. 1949, p. 380-381.

Notes on the effect of temperature on certain properties of metals with particular reference to creep.

3A-214. Thermal Stresses Associated With Fatigue. (In Russian.) M. I. Rozovskii. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 696-710.

Mathematical analysis and calculations for symmetrically heated balls

and spherical shells, and thin plates with uneven temperature distribution.

3A-215. Macro-Residual Stresses in Metals Resulting From Plastic Deformation. W. M. Baldwin, Jr. *American Society for Metals,* "Cold Working of Metals", 1949, p. 31-56.

For various cold-working operations. 14 ref.

3A-216. Plastic After Effects. J. G. Leschen. *American Society for Metals,* "Cold Working of Metals", 1949, p. 197-209.

Definition and the distinction from elastic after-effects. Discusses the phenomenon in terms of structure, including internal inhomogeneity and anisotropy of physical properties. 10 ref.

3A-217. Work Hardening Under Combined Stresses. L. R. Jackson. *American Society for Metals,* "Cold Working of Metals", 1949, p. 210-222.

The effect of average macro-straining. Concepts of shear-strain energy can be used to describe the plastic stress-strain curve. 13 ref.

3A-218. Creep of Metals. J. D. Lubahn. *American Society for Metals,* "Cold Working of Metals", 1949, p. 223-247.

Factors that may affect the shape of a strain-time curve. Suggests that strain-time relationships based upon fundamental characteristics of deformation should apply over a wide range of conditions. Limited to creep during which recovery and other transformations do not occur. 30 ref.

3A-219. Cold Work and Fatigue. Alfred M. Freudenthal. *American Society for Metals,* "Cold Working of Metals", 1949, p. 248-261.

Progressive damage, fatigue characteristics, and surface and fatigue performance. 15 ref.

3A-220. The Fracture Stress of Metals As Affected by Plastic Deformation, the Stress System, and Size. D. J. McAdam, Jr. *American Society for Metals,* "Cold Working of Metals", 1949, p. 321-364.

43 ref.

3A-221. Contributions to the Data on Theoretical Metallurgy. X. High-Temperature Heat-Content, Heat-Capacity, and Entropy Data for Inorganic Compounds. K. K. Kelley. *U. S. Bureau of Mines,* Bulletin 476, 1949, 241 pages.

Data on 70 different elements and their compounds; and tables and algebraic expressions for their representation. 599 ref.

3A-222. Magnetism. Francis Bitter. *Physics Today,* v. 2, Nov. 1949, p. 20-28.

Semi-popular exposition of the theory of magnetism. Properties and magnetic structures of the magnetic alloys.

3A-223. Strength of Engineering Materials. Gilbert Cook. *Engineer,* v. 188, Oct 14 1949, p. 424-426. Excerpts

Fundamental considerations; the tensile test, plastic deformation, fracture fatigue, and influence of size on strength properties.

3A-224. Laws of Magnetic Properties of Macro-Heterogeneous Magnetic-Solid Systems. (In Russian.) A. B. Al'tman, L. Sh. Kazarnovskii, and V. L. Nemelov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 560-566.

Laws of residual induction and coercive force as a function of phase composition. Such laws permit evaluation of properties of metal-ceramic and metal-plastic compositions. Permanent magnets from the Fe-Ni-Al system with additions of Co, Cu, and K were investigated.

3A-225. Optical Constants of Ferromagnetic Substances. (In Russian.) S. V. Vonsovskii and A. V. Sokolov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, July 1949, p. 615-620.

Relationship to spontaneous magnetization. Dielectric constants and specific electroconductivities are calculated in alternating electromagnetic fields, on the basis of a model of interacting external and internal electrons. These values are shown to be functions of spontaneous magnetization indicating existence of ferromagnetic "anomalies" of optical properties. Data are compared with those for long-wave-length radiation at temperatures close to the Curie point. 11 ref.

3A-226. Effect of Dislocation Upon Ferromagnetic Substances. (In Japanese.) Gunji Shinoda and Tokuzo Inouye *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 5-8.

Mathematical analysis. Conclusions are outlined in the English abstract.

3A-227. An Equation Representing the Very Large Internal Stresses Accompanying the Transformation of Substances. (In Japanese.) Kotaro Honda. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 13-16.

Compares theoretical and experimental values for Fe, Fe-Ni, and Mn alloys. Depression of the freezing point of water was also calculated.

3A-228. Relation Between Indentation Hardness and Strain for Metals. J. H. Palm. *Journal of Metals* (Transactions

Section) v. 1, Nov. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 904.

Experiments have shown that a certain formula expresses very well the relation between true stress and true strain for uniform monatomic deformation of plastic metals in single tension and compression A similar formula might be valid for the relation between hardness and strain. Relations between true stress and true strain, and between Vickers hardness and true strain, are shown graphically.

3A-229. Some Experiences With the Creep Behaviour of Materials. A Johansson *Engineers' Digest*, v. 10, Oct. 1949, p. 340-342; discussion, p. 342-344. Translated and condensed from *Teknisk Tidskrift*, v. 79, Feb. 19, 1949, p. 127-132.

Service experience with high-temperature materials in steam turbines, gas turbines, and creep-testing machines

3A-230. Die Spannungs-Dehnungskurve ferromagnetischer Werkstoffe (Magnetomechanische Hystereseschleife). [The Stress-Strain Curve of Ferromagnetic Materials (Magneto-Mechanical Hysteresis Curve).] Max Kornetzki. *Annalen der Physik*, ser. 6, v. 2, May 8, 1948, p. 265-269.

The relationship of torsion strength to torsion stress was determined for a soft nickel tube. Stress was applied cyclically, with stepwise increases in rate of application. Results show that relations between elongation and stress are exactly like those between magnetic induction and field strength. At very low amplitudes, variations of mechanical properties of ferromagnetic materials are parallel to those of the magnetic Rayleigh curve.

3A-231. Thickness of "Valence-Electron Atmospheres" and Electrode Potentials of Metals. (In Russian.) G. S. Koshurnikov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, July 1949, p. 777-778.

Equation for relationship of the thickness of the layer of valence electrons to radius of metallic ions. Increase of standard electrode potentials of 18 metals with increase of thickness of this layer.

3A-232. Theory of Diagrams of Additive Deformation and Calculation of True Resistance to Rupture. (In Russian.) V. Ya. Shekhter. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 957-961.

Theoretically analyzes bases of the concept of additive deformation. Curves of additive deformation can be used for determination of true resistance to rupture. Typical determinations for a series of ferrous and nonferrous metals and alloys.

3A-233. Permeabilität und Wirbelströme in Blechkernen bei sehr hohen Frequenzen. (Permeability and Turbulent Currents in Sheet Cores at Very High Frequencies.) R. Feldtkeller *Frequenz*, v. 3, Apr. 1949, p. 111-116.

Explains Wolman's theory of turbulent currents and shows mathematically that the course of complex initial permeability at low and high frequencies deviates in general from the initial permeability calculated for homogeneous sheet metal. The course of local initial permeability from surface to center of sheet is computed from the values of complex permeability.

3A-234. The Effect of Thermal-Mechanical History on the Strain Hardening of Metals. J. E. Dorn, A. Goldberg, and T. E. Tietz. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 205-224.

Previously abstracted from *Metals Technology*. See item 3a-118, 1948.

3A-235. Influence of Size and the Stress System on the Flow Stress and Fracture Stress of Metals. D. J. McAdam, Jr., G. W. Geil, D. H. Woodard, and W. D. Jenkins. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 363-381.

Previously abstracted from *Metals Technology*. See item 3a-62, 1948.

3A-236. Statistical Rate Theory of Metals. 1. Mechanism of Flow and Application to Tensile Properties. J. W. Fredrickson and H. Eyring. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 382-414.

Previously abstracted from *Metals Technology*. See item 3a-107, 1948.

3A-237. (Book) **Metallic Creep and Creep Resistant Alloys.** A. H. Sully. 278 pages. 1949. Interscience Publishers New York.

Practical and theoretical aspects. Development of the existing theory of the strength of metals with special reference to creep, and certain metallurgical factors affecting creep. Experimental techniques and creep properties of ferrous and nonferrous alloys.

3A-238. (Book) **Permanent Magnets.** F. G. Spreadbury. Sir Isaac Pitman and Sons, Ltd., Parker St., Kingsway, London, W.C. 2, England. 35s. net.

Various magnetic materials in use

in Britain. Places major emphasis on magnet design, although electromagnetism and magnetic theory are included where these subjects are relevant to permanent magnetism. Two final chapters are devoted to magnetization and demagnetization.

3A-239. (Book) **Problemy Ferromagnetizma i Magnetodinamiki.** (Problems of Ferromagnetism and Magnetodynamics.) V. K. Arkad'eva, editor. 175 pages. 1946. Section of Technical Sciences, Academy of Sciences of the U.S.S.R., Moscow and Leningrad.

Consists of 14 papers presented at a symposium held in Moscow in 1946, plus a series of diagrams for calculation of elastic and plastic permeability of plates and cylinders (p. 167-173). Papers are: "Magnetic Spectroscopy and Its Problems", V. K. Arkad'ev (p. 7-27); "Determination of Magnetic Permeability of Substances on the Basis of Their Effective Complex Magnetic Permeability by V. K Arkad'ev's Method", K. M. Polivanov (p. 29-41); "Influence of Weiss Regions on the Relationship of Magnetic Permeability to Frequency". K. M. Polivanov (p. 43-54); "Investigation of Magnetic Properties of Iron Strips Used for Cable Shields", V. M. Goitannikov (p. 55-66); "Magnetic Spectra of Permalloy at Sonic Frequencies", A. I. Pil'shchikov (p. 67-72); "Determination of Magnetic Permeability of Ferromagnetic Conductors and Plates During Application of an Alternating Field", V K. Arkad'ev and K. A. Volkova (p. 73-82); "Electrical Skin Effect in a Strip Having Complex Magnetic Permeability", V. K. Arkad'ev and A. A. Dobrovol'skaya (p. 83-87); "Reflection of Electrical Waves From a Hertz Grid, Parallel to the Magnetic Vector", O. I. Kozinets (p 89-92); "Concerning Apparent Demagnetization", L. A. Yurovskii (p. 93-96); "Theory of Properties of Polycrystalline Ferromagnetics in Medium and Weak Magnetic Fields", E. I. Kondorskii (p. 97-127); "Limiting Demagnetization Factors in Cylinders", V. K. Arkad'ev (p. 129-132); "Derived Curves of Demagnetization According to Razumovskii for Different Materials", A. F. Matalin (p. 133-141); "Sensitivity of Residual Magnetization to External Fields". S. A. Khatyukov (p. 143-145); and "Distribution of Magnetic Flux in Rails During Their Magnetization by Means of the Rolling Electromagnet Used in Defect-Detection Instruments of the F. M. Karpov Type", K. M Polivanov (p 147-166).

3A-240. **The Change of Entropy, Volume and Binding State of the Elements on Melting.** O. Kubaschewski. *Transactions of the Faraday Society,* v. 45, Oct. 1949, p. 931-940.

Physical properties of the elements, such as electrical conductivity and magnetic susceptibility, depend on the binding mechanism. Molar heat capacity at the melting point divided by absolute temperature of fusion and cubic coefficient is also a measure of the bonding mechanism. Concludes that the semi-metals partially lose their homopolar bonds on melting. A relation is found between lowering of melting point by pressure and atomic volume. 87 ref.

3A-241. **New Data on Strength of Metals.** *Aviation Week,* v. 51, Nov. 21, 1949, p. 30-32.

New data in the aircraft manufacturing industry's "Bible"—ANC-5a—"Strength of Metal Aircraft Elements". This new issue brings up to date data to be used in the design of all U. S. aircraft, whether Air Force, Navy, commercial or personal types.

3A-242. **New Interpretation of the n-Power Law in Plastic Deformation.** Herbert I. Fusfeld. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1052-1055.

Shows that the n-power law describing a true stress-strain curve, normally written as $S = k\delta^n$, can be placed in the form $S = S_0 \ (e\delta/n)^n$ where S_0 is engineering tensile strength. Application to tensile curves. A plot of S/S_0 as a function of n, for a fixed value of logarithmic strain, provides a general description of the behavior of all materials in plastic deformation.

3A-243. **Theory of the Formation of Powder Patterns on Ferromagnetic Crystals.** Charles Kittel. *Physical Review,* ser. 2, v. 76, Nov. 15, 1949, p. 1527.

3A-244. **On the Conditions for the Occurrence of Ferromagnetism in Metal Compounds.** (In English.) J. H. Gisolf. *Physica,* v. 15, Sept. 1949, p. 677-678.

On the basis of theory and known facts. certain structural conditions necessary for ferromagnetism are stated.

3A-245. **Relation Between the Thermal Expansion, the Curie Temperature and the Lattice Spacing of Homogeneous Ternary Nickel-Iron Alloys. (In English.) J. J. Went. *Physica,* v. 15, Sept. 1949, p. 703-710.**

Determined for 15 only slightly different homogeneous ternary Ni-Fe alloys containing about 50% Fe and 50% Ni. Value of the change in Curie temperature depends upon the position of the third alloying element in the periodic system of elements. There is no direct relation between

change in Curie temperature and lattice spacing.

3A-246. The Plastic Behaviour of Solids. Andrew McCance. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 241-249.

Fourth Hadfield Memorial Lecture discusses the theory of plastic extension, indicating disagreement with the von Mises-Hencky view that the plastic stage is merely a degenerated elastic stage whose behavior can be formulated by an extension of elasticity theory. Equations derived from the author's theory were tested by work on steel, Cu, Al, Pb, and nonmetallics. Includes variations in plastic behavior; brittleness and plasticity; behavior of rubber; and creep under constant load. 19 ref.

3A-247. Local Overstraining of Metals. F. Laszlo. *Engineering,* v. 168, Oct. 28, 1949, p. 437-440; Nov. 4, 1949, p. 468-470.

Oct. 28 issue. Local overstraining occurs in connection with a great variety of production processes and while in service. It may be caused by mechanical overstraining, by stress concentration and by hardening of steel in which phase transformations result in a volume change. Effects of nonuniform heating are believed to be the most harmful. Means for minimizing overstraining resulting from hot and cold working. Second installment: Results of a study of overstraining encountered during development of a 5000-hp. synchronous motor.

3A-248. Properties of Engineering Materials. Gilbert Cook. *Engineering,* v. 168, Oct. 28, 1949, p. 443-444; Nov. 4, 1949, p. 473. A condensation.

See abstract from *Engineer,* item 3A-223, 1949.

3A-249. De l'importance des propriétés ferromagnétiques pour la connaissance des alliages. (Importance of Ferromagnetic Properties of Alloys for Their Evaluation.) Charles Guillaud. *Revue de Métallurgie,* v. 46, July 1949, p. 453-456.

How the ferromagnetic properties of alloys, especially Curie point, curve of magnetization vs. temperature, and point of saturation, may be used as an aid to research on different alloys. Method of interpretation of obtained data.

3A-250. Comportement mécanique des métaux polycristallins isotropes. Analogie des facteurs fragilisants. (Mechanical Behavior of Isotropic Polycrystalline Metals. Analogy of Brittleness Factors.) André Gueussier and René Castro. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 517-536.

Influences of three essential parameters of elastic and plastic deformation (separately or combined) were studied for isotropic metals, especially steels. These parameters are: state of stress, characterized by index of triaxiality, reciprocal of the temperature of deformation, and rate of deformation. They are designated as "brittleness factors". 22 ref.

3A-251. Propriétés électriques des métaux et liaison métallique. (Electrical Properties of Metals and Metallic Bonds.) R. Piontelli. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 46, May-June 1949, p. 288-297; discussion, p. 297.

Relationship of the electrochemical properties of metals and the energy of their molecular bonds. Data for different metals.

3A-252. Investigation of the Nernst Thermomagnetic Effect in Crystals of Ferrosilicon and Ni-Mn Alloy. (In Russian.) P. G. Armaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 41-44.

Presents a theory of odd and even effects in the case of simple anisotropy and investigates the above effect. Dependence of this effect and the Nernst constant on time of annealing at 397° C. followed by rapid air cooling are indicated.

3A-253. Fatigue Characteristics of Electroformed Sheets With and Without Iron Backing. Harry K. Herschman and Carroll Thomas. *Journal of Research of the National Bureau of Standards,* v. 43, Nov. 1949, p. 477-486.

Flexural fatigue properties were determined for electroformed laminar sheets of Fe-Ni and Fe-Ni-Cr, and for plates composed of electroformed Fe-Ni sheets bonded with solder or a plastic adhesive to open-hearth iron. The fatigue limit of the Fe-Ni composite was decreased when a thin deposit of Cr was applied to the Ni face. Heating the Fe-Ni-Cr sheets at 260° C., before machining, improved their fatigue properties. Further beneficial effects were obtained by heating after machining. Fatigue limits of the plates bonded with plastic adhesive were significantly higher than those joined by soldering.

3A-254. Contribution to the Theory of Heat Resistance of Metallic Solid Solutions. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 21, 1949, p. 1037-1040.

Heat stability of solid solutions of 11 different binary, ternary, and

quaternary systems of ferrous and nonferrous metals were investigated using a new centrifugal mechanical testing method.

3A-255. Theory of the "Supporting" Properties of Metal. (In Russian.) G. V. Uzhik. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 61-64.

The ability of metals to withstand stress concentration (load applied to a notched specimen). Method of theoretical calculation. Experimental data confirm validity of the theory.

3A-256. Analytical Expression of the Relationship Between Melting Point and Thermal Stability of Metallic Alloys. (In Russian.) K. A. Osipov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 81-82.

A formula, based on Mott's equation, for the determination of rate of slip. Experimental investigation indicates validity of the formula.

3A-257. Influence of a Magnetic Field on the Conductivity of Thin Metallic Films. E. H. Sondheimer. *Nature,* v. 164, Nov. 26, 1949, p. 920-921.

A new type of magneto-resistance effect in metals has recently been discovered by D. K. C. MacDonald in thin wires at low temperatures under certain conditions. A corresponding effect exists—and a detailed mathematical treatment is possible—for the particular case of a thin film placed in a magnetic field which is normal to the surface of the film.

3A-258. The Plastic Behaviour of Solids. Andrew McCance. *Engineering,* v. 168, Nov. 25, 1949, p. 570-574.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 3A-246, 1949.

3A-259. Influence of a Magnetic Field on the Size-Variation of Electrical Conductivity. K. Sarginson and D. K. C. MacDonald. *Nature,* v. 164, Nov. 26, 1949, p. 921-922.

Theoretical analysis.

3A-260. Plastic Buckling of a Long Flat Plate Under Combined Shear and Longitudinal Compression. Elbridge Z. Stowell. *National Advisory Committee for Aeronautics,* Technical Note 1990, Dec. 1949, 17 pages.

The condition is obtained by a simple extension of the theory of plastic buckling that applies when loads are applied separately. Results are presented as interaction curves.

3A-261. Effects of Temperature Variations on Dimensional Changes of Metals. *Tool Engineer,* v. 23, Dec. 1949, p. 42.

A chart plus numerical examples.

3A-262. A.S.M. Seminar on Thermodynamics in Physical Metallurgy. John C. Fisher. *Metal Progress,* v. 56, Dec. 1949, p. 816-818.

Proceedings of seminar, held at National Metal Congress, Cleveland, 1949.

3A-263. Workhardening of Metals—A General Theory. Alfred M. Freudenthal. *Journal of the Franklin Institute,* v. 248, Dec. 1949, p. 523-536.

Plastic deformation of metals and structural theories of work hardening. A general law of work hardening. Equations and general relationships, and experimental and theoretical curves for mild steel.

3A-264. Effect of Hydrostatic Pressure on Plasticity and Strength. P. W. Bridgman. *Research,* v. 2, Dec. 1949, p. 550-555.

Tensile tests; effects of pressure on ductility and strain hardening; effect of pressure on fracture; application to wiredrawing; effect of pressure on elastic limit and shear of steel; simple apparatus for torsion experiments.

3A-265. Physical and Chemical Adsorption of Long Chain Compounds on Metals. F. P. Bowden and A. C. Moore. *Research,* v. 2, Dec. 1949, p. 585-586.

Experiments made to determine directly whether or not chemical reaction takes place between adsorbed films and metal surfaces. 10 ref.

3A-266. Magnetic-Optical Phenomena in Ferromagnetics. (In Russian.) S. V. Vonsovskii and A. V. Sokolov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Aug. 1949, p. 703-708.

A quantum-mechanical study. 12 ref.

3A-267. Technological Deformability of Metals Under Pressure. (In Russian.) S. I. Gubkin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1242-1244.

Investigation reveals the practical value of the new concept of "technological deformability". Cases where it proves especially useful. Method of determination.

3A-268. Mechanics of Elastic-Ductile-Plastic Bodies. IV. Tension and Compression of Prisms. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 892-910.

Theoretically analyzes the simplest example of deformation other than pure slip—that of unilateral tensile and compressive stressing of a rod of constant cross section. Equations covering three general cases are interpreted for different values of variables.

3A-269. Über die auf eine Versetzung wirkenden Kräfte. (Concerning the Forces Acting on a Displacement.) Günther Leibfried. *Zeitschrift für Physik,* v. 126, Oct. 17, 1949, p. 781-789.

A theoretical contribution to the theory of plastic deformation.

3A-270. Zur Theorie der Schraubenversetzung. (Concerning the Theory of "Screw" Displacement.) Günther Leibfried and Horst-Dietrich Dietze. *Zeitschrift für Physik,* v. 126, Oct. 17, 1949, p. 790-808.

The meaning of "screw" displacement; "elastic" equations, displacements in the infinite space according to Peierls, elastic solution for the plate, and displacement at a uniform rate. 14 ref.

3A-271. Conductibilité électrique des dépôts métalliques très minces à la température de l'hélium liquide. (Electrical Conductivity of Very Thin Metallic Films at the Temperature of Liquid Helium.) Pierre Lainé, Boris Vodar, Nicolas Mostovetch, Marc Barbaron, and Rudolf Spöndlin. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 815-818.

At such temperatures resistance depends, to a great extent, on applied potential. This deviation from Ohm's law is explained theoretically.

3A-272. (Book) **Numerical Analysis of Heat Flow.** G. M. Dusinberre. 227 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y.

Finite difference methods for the calculation of heat flow in solids. Much of the theory is said to be original with the author. A variety of techniques for attacking almost any heat-conduction problem in the steady or transient state. 58 ref.

3B—Ferrous

3B-1. Effect of Composition on Low-Carbon Austenitic Chromium-Nickel Stainless Steels. (Concluded.) George C. Kiefer and Claude M. Sheridan. *Industrial Heating,* v. 15, Dec. 1948, p. 2090, 2092, 2096. A condensation.

Previously abstracted from *American Iron and Steel Institute Preprint,* 1948. See item 3b-86, 1948.

3B-2. Low-Temperature Properties of 18-8 Chrome-Nickel Steels. *Steel,* v. 123, Dec. 20, 1948, p. 82-83, 119.

Data compiled by the National Bureau of Standards.

3B-3. The Problem of the Increase in Fatigue Limit Caused by Surface Shot Peening. (In Russian.) S. I. Ratner and I. I. Zakharov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1241-1246.

Proposes an explanation of the mechanism of the above. Experimental data show the validity of the theory proposed. 10 ref.

3B-4. Fourth Report of the Research Committee on High-Duty Cast Irons for General Engineering Purposes: Acicular Cast Irons. J. G. Pearce. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 327-333; discussion, p. 333-335.

Results obtained in the laboratories and experimental foundry of the British Cast Iron Research Association, in some cases by crucible melting and in others by cupola melting. Recommendations for desirable composition ranges.

3B-5. Effect of Temperature of Cold Rolling, Temperature of Testing and Rate of Pulling on Tensile Properties of Austenitic Stainless Steels With Low Nickel Content. R. A. Lincoln and W. H. Mather. *American Iron and Steel Institute,* 1948, 22 pages; discussion, p. 17-22.

Deals with alloys containing approximately 18% Cr and a little less than 7% Ni. Includes extended discussion by D. C. Buck.

3B-6. The Effect of Incidental Elements on Carbon Steel Plates. J. G. Althouse. *American Iron and Steel Institute,* 1948, 30 pages.

The point at which the residual elements, individually or collectively, change the general characteristics of plain carbon steel sufficiently to be considered significant has never been definitely determined. A cooperative investigation of the subject was therefore initiated. Nine major steel companies furnished test pieces and made determinations on 145 different heats of steel having both high and low incidental-element contents. Results of mechanical tests.

3B-7. Further Postwar Tool Steel Developments. Robert A. Cary. *Tool & Die Journal,* v. 14, Jan. 1949, p. 56-58, 60.

Further experiences with Vanadium-Alloys Steel Co.'s "Speed-Cut" (a free-machining, medium-carbon, alloy die steel) and Vasco Supreme, an alloy possessing high wear resistance in combination with an extremely high level of hot hardness and good edge strength. It is

a tungsten high speed steel with $1\frac{1}{2}\%$ C, 5% V, and 5% Co. Miscellaneous applications.

3B-8. A Metallurgical Investigation of a Contour-Forged Disc of EME Alloy. E. E. Reynolds, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note No. 1534, Nov. 1948, 30 pages.

Properties of EME alloy (Fe base, 19 Cr, 12 Ni, 3 W, 1 Cb) in the form of contour-forged discs for the rotors of gas turbines were studied at room temperature and 1200° F. Results are compared with data from other laboratories.

3B-9. Influence of Fine Cracks on the Mechanical Properties of Stainless Chromium Steel. (In Russian.) V. I. Smirnov and N. S. Orlova. *Kotloturbostroenie* (Boiler and Turbine Manufacture), July-Aug. 1948, p. 21-23.

Results of experiment show that, in the case of coincidence of the direction of fine cracks with the direction of prevailing stresses, the influence is insignificant. If the directions do not coincide, a considerable decrease in plasticity is observed. Fine cracks do not decrease the corrosion resistance of the above steel in supersaturated steam.

3B-10. Irreversible Magnetic Effects of Stress. William Fuller Brown, Jr. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 147-154.

Theoretical formulas are derived for the behavior of a soft iron or steel specimen which is first put into a state of normal magnetization and then subjected to a small tension cycle. Experimental results verified the theoretical predictions. Certain effects of diminishing alternating fields and stresses are analyzed quantitatively.

3B-11. Magnetic Domain Patterns on Single Crystals of Silicon Iron. H. J. Williams, R. M. Bozorth, and W. Shockley. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 155-178.

Magnetic powder patterns were obtained on electrolytically polished surfaces of single crystals of iron containing 3.8% Si. Domains were easily visible. Several techniques were developed that enable the direction of magnetization in each domain to be determined. Many types of domain patterns were observed. 18 ref.

3B-12. A Simple Domain Structure in an Iron Crystal Showing a Direct Correlation With the Magnetization. H. J. Williams and W. Shockley. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 178-183.

A hollow rectangle cut from a single crystal of 3.8% Si iron was studied with the aid of powder patterns and flux measurements. The domain pattern consisted of eight domains, four forming an inner rectangle magnetized in one direction and the others forming an oppositely magnetized outer rectangle. Changes in magnetization occur by the growth of one set of domains at the expense of the other. Implications in connection with Barkhausen effect, and a method of measuring the energy of the Bloch wall.

3B-13. Killed Bessemer—A New Steel of High Quality. E. G. Price. *Metal Progress,* v. 55, Jan. 1949, p. 39-42.

Commercial and economic conditions that forecast a new lease on life for bessemer steel for the manufacture of products requiring fully killed ingots—products that heretofore have been made almost exclusively from openhearth or electric steel. Mechanical properties of the metal and of seamless tubing made from it.

3B-14. Additional Ferromagnetic Resonance Absorption Measurements on Supermalloy. W. A. Yager. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 316-317.

Data are charted and compared with theory and with results previously reported.

3B-15. Contribution a l'étude des aciers faiblement alliés comportant des additions de titane pour pieces forgées résistant a chaud. (Contribution to the Study of Low-Alloy Steels With Titanium Additions for Forged Heat Resistant Structural Parts.) G. Delbart, R. Potaszkin, and A. Kohn. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 374-385; discussion, p. 385-386.

Four types of low-alloy steels were investigated from the point of view of their heat stability, castability, and mechanical properties.

3B-16. Hochlegierte Stähle mit Stickstoffzusätzen. (High-Alloy Steels With Nitrogen Additions.) Hermann Schottky. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 120-122.

A brief report on the research done by German and Austrian steel mills since about 1935, discussing various types of alloys and their properties. The prime objective was to find methods of economizing nickel. The alloys developed were highly heat resistant as well as resistant to rust, acids, and scaling; the construction steels were nonmagnetic. 18 ref.

3B-17. Zusammenhang zwischen der

Benetzung und dem elektrischen Uebergangswiderstand zwischen Eisen und Quecksilber. (Relation Between Wetting and Resistance to the Passage of Electricity Between Iron and Mercury.) E. Kobel. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 14, Nov. 1948, p. 326-330.

Several methods of wetting iron that will reduce the electrical resistance between Fe and Hg to 1-3% of its original value.

3B-18. Magnetic Susceptibility of Austenitic Steel. (In Russian.) Z. A. Sviridova and G. V. Estulin. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1207-1209.

Describes method. Determinations were made on a Cr-Mn-W steel (0.45% C, 14.4% Cr, 15.0% Mn, and 2.5% W).

3B-19. The Physics of Sheet Steel. 24. The Magnetisation Curve: Probability Analysis. G. C. Richer. *Sheet Metal Industries,* v. 25, July 1948, p. 1337-1343; Aug. 1948, p. 1550-1558; Sept. 1948, p. 1763-1768; Oct. 1948, p. 1965-1972, 1978; Dec. 1948, p. 2412-2414.

July issue: definitions and relationships; evaluation of Barkhausen dispersion index; the "middle straight"; parallelism; and trichotomy. Aug. issue: trichotomy vs. dichotomy; maximum permeability; skewness. Sept. issue: origin of skewness; ferromagnetic "overtones"; and group probabilities. Oct. issue: effects of structural disturbance and of recuperation in connection with group probabilities; "kinks" and "flats," and the "knee-point." Dec. issue: distribution of domain orientation; measurement problems. (To be continued.)

3B-20. The Fracture of Metals. C. F. Tipper. *Metallurgia,* v. 39, Jan. 1949, p. 133-137.

Fracture of mild steel is divided into three types: the first corresponds to parting along a shear plane; the second along two intersecting planes, giving a wedge-shaped fracture; and the third along a plane quite different from the shear plane, often at right angles to the tensile stress. The main conclusion is that fracture begins simultaneously at different locations, a fact confirmed by the work of Bridgman.

3B-21. Effect of Boron on the Hardenability of High-Purity Alloys and Commercial Steels. Thomas G. Digges, Carolyn R. Irish, and Nesbit L. Carwile. *Journal of Research of the National Bureau of Standards,* v. 41, Dec. 1948, p. 545-574.

Effectiveness of boron in enhancing hardenability of high-purity iron alloys varying in carbon content, and certain steels, is believed to be due to its action in retarding the rate of nucleation of ferrite and carbide while in solid solution in austenite. Hardenability of a commercial boron-treated steel, as determined by the end-quench test, was sensitive to prior thermal treatments, and carbon content. Heat treatment to produce a boron constituent and microstructures of the alloys as cast and as homogenized are described. 25 ref.

3B-22. 5 Ways That Diesels Wear: Mechanical Action; Scuffing or Welding; Surface Disintegration; Abrasive Action; Corrosive Action. *SAE Journal,* v. 57, Feb. 1949, p. 39-44; discussion, p. 41. Excerpts from "Piston Ring and Cylinder Wear in Diesel Engines" by John W. Pennington.

Several methods for combatting wear; emphasis on chromium plating, neutralization of fuel sulfur, and improved surface finishing.

3B-23. The Effect of Strain-Temperature History on the Flow and Fracture Characteristics of an Annealed Steel. E. J. Ripling and G. Sachs. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 78-90.

Results of experimental work on a low-carbon, 2.75% Si steel. Conclusions regarding the effect of straining a ferritic material at one temperature on fracture and flow characteristics at some other temperature. 11 ref.

3B-24. Ductile Cast Iron—A New Engineering Material. Albert P. Gagnebin, Keith D. Millis, and Norman B. Pilling. *Iron Age,* v. 163, Feb. 17, 1949, p. 76-84.

Material which combines the process advantages of cast iron with the product advantages of cast steel is characterized by a completely spheroidal graphite structure obtained by small additions of magnesium. Its properties, particularly high elastic modulus, high yield strength and high ductility, suggest suitability for many applications heretofore considered beyond the scope of cast iron.

3B-25. Influence de l'orientation sur la variation magnétique du module de Young dans une feuille d'invar monocristalline. (Influence of Orientation on the Magnetic Variation of Young's Modulus in a Sheet of Monocrystalline Invar.) Pierre-Jean Bouchet. *Comptes Rendus* (France), v. 227, Nov. 3, 1948, p. 904-906.

The elastic anisotropy of the above

as obtained by recrystallization of a cold worked sheet was investigated on the basis of the force-elongation diagram. Data clearly indicate the existence of the above relationship.

3B-26. (Book). **Effects of Alloying Elements and the Tensile and Hardness Properties of Carbon and Alloy Steel.** 143 pages. 1948. Heppenstall Co., Pittsburgh.

A handbook of reference data.

3B-27. Mechanical Effects of Carbon in Iron. F. R. N. Nabarro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 38-45.

By combining the theories of Snoek and Cottrell with the usual theory of age hardening it is possible to explain the existence of a yield point, quench aging, strain aging, delayed yield, and blue brittleness as consequences of the presence of carbon in iron. 11 ref.

3B-28. Dislocation Theory of Yielding and Strain Aging of Iron. A. H. Cottrell and B. A. Bilby. *Proceedings of the Physical Society,* v. 62, sec. A, Jan. 1, 1949, p. 49-62.

A theory based on the segregation of carbon atoms to form atmospheres around dislocations. The form of such atmospheres and the force needed to release a dislocation from its atmosphere. How yielding and strain aging may be explained by this theory.

3B-29. Investigation of Failures in Railroad Rails and Their Prevention. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 485-489.

Results of examination of 55 failures.

3B-30. Rail Failure Statistics. W. C. Barnes, C. B. Bronson, and L. T. Nuckols. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 489-505.

3B-31. Joint Bar Wear and Failures; Revision of Design and Specifications for New Bars and Bars for Maintenance Repairs. Ray McBrian and others. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 514-516.

A subcommittee progress report.

3B-32. Seventh Progress Report of the Rolling Load Tests of Joint Bars. R. S. Jensen. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 517-532.

Experimental results. Includes corrosion test data.

3B-33. Causes of Shelly Spots and Head Checks in Rail; Measures for Their Prevention. L. S. Crane and others. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 534-535.

It is believed that gage-corner shelling characterized by spalling of metal from the gage corners and developing in a horizontal direction may be retarded by the use of heat treated rail steel. It is also believed that the modified head contours incorporated in recently revised AREA rail sections will materially assist in retarding the onset of shelling.

3B-34. Seven-Year Summary Report of Shelly Rail Investigation at the University of Illinois. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 536-542.

Experimental results.

3B-35. Summary Report on the Examination of Shelled Rails to Joint Contact Committee on Rails of Association of American Railroads and American Iron and Steel Institute. G. K. Manning. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 542-557.

Examination of some 200 shelled spots from the track of 11 major roads indicated that the shelled spots were predominately of surface origin. Evidence indicates that completely pearlitic rail is somewhat more resistant to shelling than is rail containing pearlite plus ferrite; however, it is of doubtful practical importance.

3B-36. Fatigue Tests of Manganese Steel. R. S. Jensen. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 579-588.

Test method and apparatus. Includes corrosion-fatigue results.

3B-37. Internal Stresses in Hardened and Dimensionally Stabilized Steel. L. W. Nickols. *Engineer,* v. 187, Feb. 4, 1949, p. 132.

Results of experiments which prove that considerable residual stress is still present in hardened and stabilized steel. This was shown by the fact that a hardened and stabilized bar of 1 in. diam. and 9 in. length decreased in length by 0.013 in. on removing, by successive layers, 0.6 in. of the diameter. Over a previous 9-year period of observation no dimensional changes had been observed. Calculated stress distribution.

3B-38. The Tensile Yield Strength of Certain Steels Under Suddenly Applied Loads. F. V. Warnock and J. B. Brennan. *Institution of Mechanical Engineers, Proceedings,* v. 159, War

Emergency Issue No. 37, 1948, p. 1-10; discussion, p. 14-23.

Dynamic tensile yield stresses were determined for eight steels, including one mild steel, two plain carbon steels, two C-Mn steels, one heat treated alloy steel, and two cast steels. Comparison with static values revealed an increase in yield stress from 21 to 36% for the carbon steels under dynamic loading. This increase diminishes with increase in static yield strength. The annealed cast steels behaved in a similar manner, but the heat treated alloy steel showed no appreciable increase in yield strength. A theory for the variation in sensitivity of yield strength to load rate is proposed.

3B-39. The Dynamic Yield Strength of Steel at an Intermediate Rate of Loading. A. F. C. Brown and R. Edmonds. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 37, 1948, p. 11-14; discussion, p. 14-23.

Dynamic and static tensile yield strengths of eight steels varying from mild steel to a heat treated low-alloy steel were compared, rate of loading in the dynamic tests being such as would occur in a ship under the action of an underwater explosion. Dynamic yield strength of the steels with low static strength was 20-30% greater than their static yield strength but, for the stronger steels, the increase was less, being negligible in the case of the heat treated low-alloy steel.

3B-40. The Effect of Alloys on the Properties of Steel. T. W. Merrill. *Product Engineering,* v. 20, Mar. 1949, p. 124-127.

How Mo, V, Cu, Ni, Cr, and other alloying elements affect hardenability and mechanical properties of low-alloy steel. Factors in choosing steels for ease of machining, welding, and hot and cold working.

3B-41. The Magnetic Properties of Stainless Steel. W. A. Stein. *Electrical Engineering,* v. 68, Mar. 1949, p. 204. Digest of paper to be published in *AIEE Transactions.*

Solenoid-valve manufacturers encountered so many valve failures in attempting to use regular steel in valves exposed to acid vapors that they were forced to resort to the magnetically inferior stainless steels. Hence, six of the more common stainless steels were investigated with respect to magnetic properties.

3B-42. Causes and Prevention of Drill Pipe and Tool Joint Troubles. Part 6. Tool Joints. (Concluded.) H. G. Texter and R. S. Grant. *World Oil,* v. 128, Mar. 1949, p. 106-110, 112; discussion, p. 112, 114.

Wear on the outer surface of tool joints; corrosion-fatigue failures in tool joints; and their minimization.

3B-43. The Specific Heat and Resistivity of High-Purity Iron up to 1250° C. P. R. Pallister. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 87-90.

In order to obtain true specific heats at thermal equilibrium, a method was adopted in which the temperature increments were small, and the intervals between observations were occupied by slow heating or cooling of the annealed specimen. Equipment and results. 16 ref.

3B-44. Some Aspects of the Effect of Metallurgical Structure on Fatigue Strength and Notch-Sensitivity of Steel. T. J. Dolan and C. S. Yen. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 32 pages.

Extent to which changes in metallurgical structure affect the above. Experimental data from static, fatigue, and impact tests, on two alloy steels and one carbon steel, quenched and tempered to approximately the same hardness level. No direct functional relationship is apparent between notch-sensitivity in fatigue and Charpy testing. 14 ref.

3B-45. The Hardenability Effect of Molybdenum. J. M. Hodge, J. L. Giove, and R. G. Storm. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 218-227.

Results of previous work have indicated significant differences in the above effect in nickel and in chrominum steels. Both end-quench hardenability and isothermal transformation tests on two series of steels of varying Mo content were made in order to shed further light on the mechanism of this behavior.

3B-46. Steels With Higher Than Normal Silicon Content. C. K. Donoho. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 151-164; discussion, p. 164-179.

Results of use of silicon as an alloy. Results of tensile tests of keel-block bars and of heat.

3B-47. Effect of Deoxidation on Mechanical Properties. Martin F. Milligan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 180-181; discussion, p. 181-182.

General discussion and a review of previous work.

3B-48. Effect of Some Melting Variables on the Tensile Properties of Acid Electric Steel. Sam F. Carter. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 182-197; discussion, p. 197-202.

An investigation at the American Cast Iron Pipe Co. 15 ref.

3B-49. Influence de la surface sur la fatigue des métaux. (Influence of Surface Condition on the Fatigue of Metals.) M. Ros. *Journées des Etats de Surface,* 1946, p. 207-218.

See abstract from *Revue de Métallurgie,* item 3b-29, 1948.

3B-50. Soft Iron for the Electromagnet of a Cyclotron. J. J. Went. *Philips Technical Review,* v. 10, Feb. 1949, p. 246-254.

The more important characteristics of ferromagnetic materials classified in four groups. Possible applications for each group.

3B-51. Internal Stresses in Steel Castings. H. Elliss. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 85-93; discussion, p. 398-431.

Origin and effects of internal stresses in steel castings. Major factors producing internal stress are casting design, molding technique, and foundry practice; solid contraction in the mold; welding operations; fettling, pickling, and heat treatment processes; and effects of steelmaking practice and steel composition on susceptibility to "hot-tear" formation. 19 ref.

3B-52. Residual Stresses in Beams After Bending. G. Forrest. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 153-162; discussion, p. 398-431.

Distribution of residual stresses in beams of rectangular and T-section bent in the plastic range. These stresses in certain forms of beams may approach the ultimate tensile stress of the material. Effects of stretch bending and reverse bending.

3B-53. Internal Stresses in Railway Materials. Hugh O'Neill. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 337-349; discussion, p. 463-484.

Eighteen examples of the occurrence of internal stress, in half of which it is deliberately used for useful purposes. Details of manufacturing stresses in various types of rail, and the effect of high-speed pounding by locomotives. Values of the stress in peened piston rings, shot-blasted spring plates, boiler rivets, and expanded boiler tubes. The effect of service straining on stress removal. Fatigue cracking in axle press-fits, and the shrink-fits of shells and tires. 41 ref.

3B-54. Wechselfestigkeit und Kerbwirkungszahlen von unlegierten und legierten Stählen bei +20 und −78°. (Fatigue Strength and Notch Effect of Unalloyed and Alloyed Steels at +20 and −78° C.) Max Hempel. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 25-26.

Effect of temperature on the above as determined by recent German work.

3B-55. Der Einfluss von Pfannenzusätzen auf das Gefuge, die Festigkeitseigenschaften und das Wachsen von Grauguss. (The Effect of Ladle Additions on the Structure, Strength Properties, and Growth of Gray Cast Iron.) C. W. Pfannenschmidt. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 1-10.

The effect of Ca-Si, SiC, and ferrosilicon on the properties of cast iron. 13 ref.

3B-56. Elongation of Polycrystalline Silicon Iron (4.2% Si) in the Temperature Range From −195° C. to +800° C. (In Russian.) G. N. Kolesnikov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Nov. 1948, p. 1449-1455.

Diagrams of elongation of the above may be classified in two different groups: "low temperature" and "high temperature". Dependence of resistance to deformation, uniform elongation, and sum of elongation and "quasi" uniform elongation on temperature.

3B-57. Structural High-Tensile (Low Alloy) Steel. O. A. Kerensky. *Engineer,* v. 187, Mar. 4, 1949, p. 238-241. A condensation.

Types of the above; methods of manufacture (cold working, heat treating, and alloy additions); welding; corrosion; allowable stresses; effect of fatigue; and economics of use. Weight savings make wider use of such steels in structures highly desirable. 32 ref.

3B-58. Meeting High Performance Demands in Engineering Construction With Meehanite Metal. A. Campion. *Engineer,* v. 187, Mar. 4, 1949, p. 243-245. A condensation.

Mechanical properties of the five types and applications.

3B-59. Effect of Variation in Silicon

Content on the Properties of Silicon-Manganese Spring Steel. W. E. Bardgett and F. Gartside. *Metallurgia,* v. 39, Feb. 1949, p. 171-177.

Effect of varying the silicon content between 0.5 and 2.64%, on susceptibility to decarburization, tempering, hardenability and mechanical properties, including fatigue. Decrease in silicon below 1.5% increases susceptibility to decarburization, while increase beyond the upper limit is liable to result in inferior notch toughness and fatigue strength.

3B-60. Study of the Causes for and Corrective Measures Necessary to Prevent Cracking of Boiler Plates Made of Various Steels. Ray McBrian, R. C. Bardwell, R. E. Coughlan, H. H. Service, Walter Hedeman, and J. D. Johnson. *Master Boiler Makers' Association, Official Proceedings,* 1948, p. 220-235; discussion, p. 235-253.

Studies of failed boiler-shell materials received from the various railroads in the U. S. and a continuing investigation into materials for construction of locomotive boilers. No satisfactory material has been developed which can be guaranteed to resist cracking in riveted construction.

3B-61. Wirkung des Kaltreckens und der nachfolgenden kunstlichen Alterung auf die Festigkeitseigenschaften von Stahl besonders bei mêhrachsiger Verformung. (Effect of Multiaxial Cold-Working Followed by Artificial Aging on the Strength Properties of Steel.) Alfred Krisch. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 165.

The "Bauschinger effects" of stress in two or three main directions. Results of Krisch and Straeter's experiments with thick-walled tubes of alloyed and unalloyed steels.

3B-62. Possible Embrittlement of Cold Worked 18-8 at Moderate Temperatures. M. A. Scheil. *Metal Progress,* v. 55, Mar. 1949, p. 342-343.

Test results which show loss of ductility and considerable elongation on tensile testing of common grades of 18-8 at temperatures in the neighborhood of 350° F. Tensile strength of Type 304 was reduced from about 150,000 psi. at 70° F. to about 135,000 psi. at 350° F. Further information is solicited on this unexplained phenomenon.

3B-63. Small-Angle Scattering of Neutrons in Iron. D. J. Hughes, M. T. Burgy, R. B. Heller, and J. W. Wallace. *U. S. Atomic Energy Commission,* AECD-2363, Aug. 1948, 7 pages.

New effect which takes place in unmagnetized iron, but not in magnetized. Results of measurements and theory involved.

3B-64. Influence of Stress on the Hall Effect in Iron-Nickel Alloys Under Positive Striction. (In Russian.) G. P. Priporova. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Nov. 1948, p. 1041-1044.

The influence of plastic and elastic deformations on the Hall emf. in an Fe-Ni alloy under positive stress. Elastic deformation does not influence the value of the Hall coefficient; on the contrary, in the case of plastic tensile stresses, the Hall coefficient decreases with deformation.

3B-65. Influence of Alloying Elements on the Thermal Stability of Chromium-Nickel Austenite. (In Russian.) A. M. Borzdika. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 21, 1948, p. 265-267.

The influences of W, Mo, Ti, and Cb on the heat resistance of Cr-Ni steels. The marked difference in atomic diameters of the above elements and of Fe, Cr, and Ni is the main cause of the increase in creep strength of the alloy and, hence, its higher heat resistance.

3B-66. Evaluation of Cold Brittleness of Steel. (In Russian.) D. M. Zagorodskikh. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1499-1501.

The influence of phosphorus. Recommends that steels be tested for impact strength, not at room temperature, but at the critical temperature of brittleness.

3B-67. Effect of Boron on Structure and Some Physical Properties of Plain Cast Irons. A. I. Krynitsky and Harry Stern. *American Foundrymen's Society,* Preprint No. 47, 1949, 13 pages.

Additions, ranging from 0.001-0.48% B were determined by casting chill plates, wedge castings, and arbitration bars. 29 ref.

3B-68. Stals Aldring. (Aging of Steel.) B. D. Enlund. *Jernkontorets Annaler,* v. 133, no. 1, 1949, p. 1-28.

Low-carbon steels often show considerable embrittlement on aging at room temperature or at different elevated temperatures if they are previously cold worked. If the steel is transformed into a sufficiently fine-grained condition no embrittlement will occur. Grain refinement may be by Al addition and normalizing or by quenching and tempering. The increase in

hardness on aging after coldworking was found to be definitely related to grain size.

3B-69. Développement, effets et meseurs des précontraintes superficielles des pieces de machine. (Development. Effect and Methods of Induction of Surface Stresses in Machine Parts.) Jacques Pomey, Louis Abel, and Francois Goutel. *Comptes Rendus,* v. 228, Jan. 17, 1949, p. 223-224.

Experimental results indicate that the development of triaxial stresses close to the surface improves elastic and fatigue properties of steel machine parts. Mechanism of this phenomenon. Method of production of such stresses.

3B-70. Meeting High Performance Demands in Engineering Construction With Meehanite Metal. A. Campion. *Metallurgia,* v. 39, Mar. 1949, p. 272-276.

Properties and applications.

3B-71. Selecting Steels With High Creep Strength. *Steel Processing,* v. 35, Mar. 1949, p. 143-144. Reprinted from *Mechanical World* (London).

A general discussion.

3B-72. Low Temperature Properties of the Austenitic Stainless Steels. R. H. Henke. *Product Engineering,* v. 20, Apr. 1949, p. 104-107.

How temperatures of −320° F. change impact strength, tensile strength, ductility, and endurance limit of annealed, cold drawn, and welded Cr-Ni stainless steels. Comparisons with straight Cr stainless steels.

3B-73. Gray Iron Castings. T. C. Du Mond. *Materials & Methods,* v. 29, Apr. 1949, p. 71-78.

Properties and how to process such castings. Alloy and controlled irons. Finishing, machining, heat treating, and welding are dealt with.

3B-74 Gray Iron as a Die Material. C. O. Burgess. *Tool Engineer,* v. 22, Apr. 1949, p. 26-28.

Properties of gray irons of controlled analysis which make them useful for dies. Design principles.

3B-75. Die magnetische Nachwirkung bei verschiedenen Sorten von Silizium-Eisen. (The Magnetic After-Effect in Different Types of Silicon-Iron.) Hans Wilde and Georg Bosse. *Frequenz,* v. 2, Aug. 1948, p. 214-215.

A preliminary report. Magnetic after-effect at different temperatures.

3B-76. The Criterion of "Yield" of Gun Steels. J. L. M. Morrison. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 39, 1948, p. 81-94; discussion, p. 99-114.

Tests on standard Ni-Cr-Mo gun steel. The standard gun steel in the form of bars, shows a drop in stress at the yield point; the same steel in the form of forgings does not, nor do any of the alternative steels. In the first case, the criterion for the occurrence of the initial yielding was found to be the existence of a critical maximum shear stress; plastic flow continues in accordance with the Mises-Hencky criterion. In all the other steels, plastic flow occurs and continues in accordance with the same criterion.

3B-77. A Comparison of Some Carbon Molybdenum Steels on the Basis of Various Creep Limits. A. E. Johnson and H. J. Tapsell. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 40, 1948, p. 165-171; discussion, p. 172.

An experimental study of the relationship between short-time and long-time creep limits has been carried out on six C-Mo steels, and the results obtained indicate similar limitations in the applicability of short-time creep limits to estimation of design stresses for long-time service, as disclosed by prior tests on carbon steels. No reason is apparent for the correlation of short and long-time creep limits.

3B-78. Theory of the Coercive Force of Steels. (In Russian.) E. Kondorskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Dec. 11, 1948, p. 507-510.

The influence of inclusions on the critical field and coercive force was investigated theoretically using a different approach from that commonly used. New formulas are derived for the calculation of the critical field. Obtained data are in agreement with those resulting from experimental investigation.

3B-79. Aciers russes de remplacement pour matrices d'estampage et coquilles de coulée sous pression. (Substitute Russian Steels for Stamping Dies and for Die-Casting Molds.) G. L. Livshits. *Circulaire d'Informations Techniques,* v. 6, Jan. 1949, p. 10-14. Translated and condensed from *Stal* (Steel), v. 8, Feb. 1948, p. 153-156.

Chemical composition and mechanical properties of above steels specially developed for saving critical materials, particularly tungsten. Basic composition is 0.38-0.55% C, 0.40-1.65% Mn, 0.80-1.70% Si, 2.5-12.5% Cr, 0.80-1.80% W, 0.20-0.40% V, and less than 0.30% Ni. Tungsten may be replaced by Mo (0.40-0.90%). Optimum conditions of heat treatment are indicated.

3B-80. La conductibilité thermique des aciers entre 500 et 900° C. (Thermal Conductivity of Steels Between 500 and 900° C.) *Circulaire d'Informations Techniques,* v. 6, Jan. 1949, p. 21-27.

Consists mainly of tables of data collected from eight literature sources on a wide variety of steels.

3B-81. Effect of Aluminum and Vanadium on Toughness of High Hardenability Cast Steels. J. F. Wallace. *American Foundrymen's Society,* Preprint 2, 1949, 12 pages.

Object was to compare effects of the above when used as grain refiners, on the toughness of fully quenched and drawn samples from three cast steels of high hardenability. The chemical compositions were all low in carbon and included low, medium, and high Mn steels alloyed with varying amounts of Ni, Cr, and Mo. 18 ref.

3B-82. Unappreciated Advantages of Gray Iron. Frederick G. Sefing. *Canadian Metals and Metallurgical Industries,* v. 12, Apr. 1949, p. 16-19.

Properties of the various grades. Advantages and limitations. Corrosion data.

3B-83. Notch Sensitivity of Steel Evaluated by Tear Test. Noah A. Kahn and Emil A. Imbembo. *Welding Journal,* v. 28, Apr. 1949, p. 153s-165s; discussion, p. 165s-166s, 177s.

Notch-sensitivity characteristics of plate steels consisting of rimmed, semi-killed, and fully killed medium steel in thicknesses up to 1¼ in. Effect of variations in specimen geometry and plate thickness, effect of nitrogen content, and applicability of the tear-test method to quality control.

3B-84. Transition Temperatures of Structural Steels. Effects of Geometry and Welding on High Yield Strength Steels. A. Boodberg and E. R. Parker. *Welding Journal,* v. 28, Apr. 1949, p. 167s-177s.

Various tests on high-yield-strength structural steels. Specimens were tested in tension at various temperatures. Auxiliary tests were conducted to determine the effect of welding on their behavior.

3B-85. Brittle Fracture in Ship Plate. G. Vedeler. *Engineering,* v. 167, Apr. 1, 1949, p. 289-290.

Critical analysis of recent work from the point of view of a ship designer. Confined to the brittle fracture due to triaxial stresses caused by a discontinuity.

3B-86. Influence of Short-Time Overloading on the Yield Point of Steel. (In Russian.) G. I. Pogodin-Alekseev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 91-95.

Investigated for structural steel. Results indicate the inadequacy of previous research on this subject. Curves showing the influence of time of overloading on the yield point and the dependence of critical time of overloading on the overloading value in per cent.

3B-87. Temperature Variation and Temperature Hysteresis of the Magnetic Anisotropy of Meteoric Iron. (In Russian.) L. V. Kirenskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 11, 1949, p. 191-194.

Theory and data.

3B-88. Grain-Size Properties of Some Railway Steels. B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 8, Feb. 1949, p. 39-48.

Old and new railway steels, partially or fully deoxidized with Al, were studied with respect to the relationship of structure (especially grain size) to mechanical properties. Recommended applications for both coarse- and fine-grained steels.

3B-89. High-Duty Irons. *Automobile Engineer,* v. 39, Apr. 1949, p. 157-161.

Properties and production methods for meehanite irons made by a British firm.

3B-90. The Engineering Properties of Meehanite. A. Campion. *Foundry Trade Journal,* v. 86, Apr. 14, 1949, p. 335-338; Apr. 21, 1949, p. 369-372, 375.

Previously abstracted from *Engineer,* item 3B-58, 1949.

3B-91. Ductile Cast Iron. *Industrial and Engineering Chemistry,* v. 41, May 1949, p. 7A, 10A, 12A.

Development progress. By addition of Mg to molten cast iron, graphite is converted to a spheroidal or nodular form, which greatly improves strength, ductility, and elastic modulus. Through this development a low-cost foundry iron may become available which is easily produced and has excellent casting and physical properties, hitherto found only in cast steels.

3B-92. Vanadium Alloy Steels. T. W. Merrill. *Product Engineering,* v. 20, May 1949, p. 138-142.

Properties and applications of the principal types of V-containing steels, including forging steels, casting steels, spring steels, carburizing steels, and plate steels.

3B-93. Anomalous Behavior of the Dielectric Constant of a Ferromagnetic Ferrite at the Magnetic Curie Point. Frank G. Brockman, P. H.

Dowling, and Walter G. Steneck. *Physical Review*, ser. 2, v. 75, May 1, 1949. p. 1440.

Effective dielectric constant, as a function of temperature, measured at 10,000 c.p.s. on a block of a commercial ferromagnetic ferrite provided with evaporated gold electrodes. It was found that the behavior of the dielectric constant at the magnetic Curie point can be described on the basis of straightforward electromagnetic theory.

3B-94. Report on Physical Properties Influenced by As-Quenched Hardness. *Society of Automotive Engineers*, Report MR-73, 42 pages.

Three steels, 1345, 13T45, and 4140, were investigated on the basis of their similar carbon contents, widely different hardenability, and the fact that the relatively high hardenability of the 13T45 steel was derived from special addition agents. Samples were quenched to Rockwell C-40, 47 and 55 and subsequently tempered to Rockwell C-35, for each grade. Microstructures representative of each heat treatment were studied in relation to physical test results.

3B-95. Some Aspects of the Effect of Metallurgical Structure on Fatigue Strength and Notch-Sensitivity of Steel. T. J. Dolan and C. S. Yen. *American Society for Testing Materials, Proceedings*, v. 48, 1948, p. 664-689; discussion, p. 690-695.

Previously abstracted from advance reprint. See item 3B-44, 1949.

3B-96. Some Characteristics of Residual Stress Fields During Dynamic Stressing Above the Endurance Limit. James B. Duke. *American Society for Testing Materials, Proceedings*, v. 48, 1948, p. 755-762; discussion, p. 763-766.

Previously abstracted from preprint. See item 24b-71, 1948.

3B-97. Changes Found on Reciprocated Steel, Chromium Plate, and Cast Iron Sliding Surfaces. J. N. Good and Douglas Godfrey. *American Society for Testing Materials, Proceedings*, v. 48, 1948, p. 841-853; discussion, p. 854-856.

Changes in surface composition and surface characteristics were studied under run-in and wear conditions for forged steel rubbed against cast iron, chromium-plated cast iron rubbed against steel, and cast iron rubbed against cast iron. Use was made of specialized techniques in X-ray and electron diffraction, of chemical and metallographic analyses, and of hardness measurements. 24 ref.

3B-98. Eigenschaften von Rohguss mit 12% Mn (Hadfield-Stahlguss). [Properties of Pig-Iron Castings Containing 12% Mn (Hadfield-Cast Steel).] F. Roll. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 18-23.

Effect of the C-Mn ratio, and of Si and P. The steels were examined for hardness, appearance of fracture, microstructure, and high-temperature strength.

3B-99. Ueber magnetische Messungen an dauerbeanspruchten Stahlstäben. (Magnetic Measurements on Fatigue-Stressed Steel Bars.) Kurt Fink and Max Hempel. *Archiv fur das Eisenhuttenwesen*, v. 20, Jan.-Feb. 1949, p. 75-78.

Changes in magnetic induction on normalized and annealed solid bars of 0.4% carbon steel subjected to fatigue-bending stresses. 10 ref.

3B-100. On the Electrical Properties of Cold Worked Iron Carbon Alloys. A. B. Bhatia. *Proceedings of the Physical Society,* v. 62, sec. B, Apr. 1, 1949, p. 229-237.

Change on "aging" was investigated theoretically. During the process, the carbon atoms diffuse into the dislocations, thus forming rows of atoms. Electrical resistance due to scattering of electrons by these rows is expressed in terms of the scattering power of a single carbon atom dissolved in the iron lattice, and hence in terms of the resistance of the same number of randomly distributed carbon atoms. It is found that this change depends on the wavelength of the electrons at the Fermi surface. Using a value of about 0.6 electrons per atom for iron; agreement with observed diminution in resistance is satisfactory.

3B-101. Effect of Sulphur on Quality and End Uses of Steel Products. M. Tenenbaum. *American Iron and Steel Institute,* Preprint, 1949, 39 pages.

Effects on tensile strength, hardness, ductility, impact resistance, hot workability cleanliness, machinability, grain size, grain-coarsening temperature, hardenability, weldability, and corrosion. Manner and degree to which sulfur influences the quality of various end products, data obtained by means of a questionnaire sent to 26 steel plants. 24 ref.

3B-102. Engineering Construction; Meeting High Performance Demands With Meehanite Metal. A. Campion. *Iron and Steel,* v. 22, Apr. 1949, p. 131-135; May 1949, p. 154-156.

Previously listed from condensed version under similar title: *Engineer,* item 3B-70, 1949.

3B-103. Mechanical Properties of Stainless Steels at Subzero Temperatures.

John H. Hoke, Philip G. Mabus, and George N. Goller. *Metal Progress,* v. 55, May 1949, p. 643-648.

Ten of the more common stainless steels were tested down to —320° F. The austenitic grades have slightly higher Izod impact strength at low temperature than at 70° F. Ferritic and martensitic steels have low impact strength below 0° F. All grades show increased tensile strength at subzero temperatures, with more or less decrease in ductility.

3B-104. Selection and Heat Treatment of Forming Tools. Norman I. Stotz. *Metal Progress,* v. 55, May 1949, p. 652-657.

Principles as they relate to metal-forming tools, such as: plastic deforming tools (hot); die-casting and permanent-mold dies; forming and trimming dies; punches and chisels; and shear knives.

3B-105. The Sigma Phase in Stainless Steels. D. A. Oliver. *Metal Progress,* v. 55, May 1949, p. 665-667.

Attempts a restatement of the salient features of the sigma phase, supplemented by more recent results. Mechanical and magnetic properties and corrosion resistance vs. reheating temperatures for the 18-8 alloys, indicating influence of this phase.

3B-106. Composition and Property Variation of Two Steels. C. J. Osborn, A. F. Scotchbrook, R. D. Stout, and B. G. Johnston. *Welding Journal,* v. 28, May 1949, p. 227s-235s.

Progress Report No. 2 on the effect of fabrication processes on steels used in pressure vessels. Variation among heats of composition, structure, and properties of rimmed and aluminum-killed steels being used in the pressure-vessel research program at Lehigh University. Complete mill history. 10 ref.

3B-107. Nodular Graphite Cast Iron as an Engineering Material—A Correlated Review. *Materials & Methods,* v. 29, May 1949, p. 45-48.

Characteristics, possible applications, and method of production.

3B-108. Izod, Tensile and Hardenability Tests on Some Aircraft Steels of Australian Manufacture. A. R. Edwards and F. G. Lewis. *Council for Scientific and Industrial Research, Commonwealth of Australia,* Aeronautical Research Report ACA-38, Jan. 1948, 23 pages.

Izod properties of above steels in five conditions of heat treatment at temperatures of —50 to 50° C. Tensile, hardness, and hardenability tests at room temperature, together with chemical analyses and metallographic examinations.

3B-109. The Mechanical Properties Avialable in Cast Iron. J. E. Hurst. *Pig Iron Rough Notes,* Winter-Spring 1949, p. 19-25.

Breaking, torsional, fatigue, and impact strength. Modulus of elasticity and permanent set, damping capacity, hardness, and resistance to wear.

3B-110. Fundamental Concepts. M. Gensamer. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 5-16.

Reasons for measuring mechanical properties. Flow and fracture.

3B-111. The Physics of Sheet Steel. 25. The Problem of Cyclic Magnetisation. (Concluded.) G. C. Richer. *Sheet Metal Industries,* v. 26, May 1949, p. 965-970.

Final installment on cyclic magnetization describes evaluation of the Steinmetz coefficient, and discusses use of the Yensen equations. Economic barriers to achievement of theoretically attainable low hysteresis losses. (Series to be continued.)

3B-112. Some Notes on Brittleness in Mild Steel. Johan Görrissen. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 16-28.

Brittle fracture in unkilled mild steel with special reference to effect of grain size and structure. It was confirmed that grain boundary cementite is not formed above the A_1 temperature, but is formed during slow cooling from A_3 to room temperature. Steels containing 0.05-0.30% Si or 1.25-1.50% Mn are considered more suitable than mild steel for chain-making. Addition of Al is beneficial in controlling grain size and reducing liability to aging. Up to 0.25% C does not affect impact value. Need for controlled cooling rates, not too fast or too slow. 12 ref.

3B-113. The Action of Boron in Hardening Steel. *Industrial Heating,* v. 16, May 1949, p. 818, 820, 822.

Previously abstracted from *Journal of Research of the National Bureau of Standards,* item 3B-21, 1948.

3B-114. Ferromagnetic Resonance at Microwave Frequencies in an Iron Single Crystal. Arthur F. Kip and Robert D. Arnold. *Physical Review,* ser. 2, v. 75, May 15, 1949, p. 1556-1560.

Resonance absorption was observed at 23,675 and 9260 mc. per sec., using an external magnetic field applied perpendicular to the r.f. magnetic field in the plane of the crystal surface.

3B-115. Stand und Entwicklung der spektrochemischen Analyse (Emis-

sions-Analyse.) [Status and Development of Spectrochemical Analysis (Emission Analysis).] Heinrich Kaiser. *Zeitschrift fur Angewandte Physik*, v. 1, Jan. 1948, p. 35-45.

A review. 127 ref.

3B-116. Bericht uber die Eigenschaften der technisch wichtigen sinterbaren Dauermagnetlegierungen des Metallsystems Eisen-Nickel-Aluminium mit Zusätzen von Titan und Kobalt. (Report on the Properties of the Commercially Important Sinterable Permanent Magnet Alloys of the Iron-Nickel-Aluminum System With Titanium and Cobalt Additions.) Wilhelm Zumbusch. *Zeitschrift fur Angewandte Physik*, v. 1, Jan. 1948, p. 45-47; Mar. 1948, p. 98-104.

3B-117. Investigation of Temper Brittleness in Low-Alloy Steels. S. A. Herres and A. R. Elsea. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 366-370.

Notched-bar impact values at 75 and —40° F. of specimens of 20 steels water quenched and furnace cooled from the tempering temperature.

3B-118. Vanadium Data Sheet: Vanadium Alloyed Irons. R. G. McElwee. *Vancoram Review*, v. 6, no. 1, [1948], p. 12-13.

Compositions, mechanical properties, and applications.

3B-119. Effect of Manufacturing Practice on Creep and Creep-Rupture Strength of Low-Carbon Steel. G. V. Smith and E. J. Dulis. *American Society for Testing Materials*, Preprint 18, 1949, 16 pages.

Comparative tests at 850° F. on 12 heats of low-carbon steel made by different melting and deoxidation practices show a rather wide range in results dependent chiefly upon deoxidation practice. 13 ref.

3B-120. Present Knowledge of Low-Carbon 18-8. H. W. Gillett. *American Society for Testing Materials*, Preprint 22, 1949, 14 pages.

Austenite stability, carbide precipitation, weldability, and corrosion resistance. 46 ref.

3B-121. Magneto-Thermal Effects in Ferromagnetics. E. C. Stoner and P. Rhodes. *Philosophical Magazine*, ser. 7, v. 40, May 1949, p. 481-522.

Quantitative treatment of the basic effects. 31 ref.

3B-122. Properties of Stainless Steel Fasteners. Richard E. Paret. *American Machinist*, v. 93, June 2, 1949, p. 129.

3B-123. How Boron Affects Steel Hardenability. *Steel*, v. 124, June 6, 1949, p. 105, 135-136, 138.

Previously abstracted from *Journal of Research of the National Bureau of Standards*, item 3B-21, 1949.

3B-124. Cast Ferrous Materials for Subzero Service. John W. Juppenlatz. *Iron Age*, v. 163, June 9, 1949, p. 46-49.

Suitability of ferritic and austenitic steels at various temperature levels. Effect of temperature on tensile and impact properties of cast 19-9 stainless steel.

3B-125. Sur les propriétés mécaniques des pieces de forge en aciers a faibles teneurs en nickel, chrome et molybdene. (Mechanical Properties of Steel Forgings Containing Small Amounts of Nickel, Chromium, and Molybdenum.) R. Potaszkin. *Revue de Métallurgie*, v. 46, Mar. 1949, p. 125-140; discussion, p. 140.

Specimens contained 0.28-0.46% C; 0.26-0.35% Si; 0.78-1.11% Mn; 0.60-0.81% Ni; 0.50-0.60% Cr; and 0.16-0.27% Mo. Data on mechanical properties and effect of heat treatment on them, and on microstructure, are presented and compared with those of low-alloy Ni-Cr-Mo, Ni-Cr, and Cr-Mo steels.

3B-126. Work Expended in Destruction of Multi-Strip Specimens as a Function of Number of Strips. (In Russian.) G. I. Pogodin-Alexeev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 345-351.

Investigated for two different alloy steels. Specimens of the same thickness, but made up of different numbers of separate leaves joined at the ends, were subjected to bending and to compressive stresses. The number of leaves varied from 3 to 20. Obtained results.

3B-127. Plasticity of Steel and Smoothness of Its Working Surfaces. (In Russian.) F. P. Rybalko and M. V. Yakutovich. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 673-674.

The above was studied for samples quenched from 800° C. and annealed in the salt bath at 200, 300, 400, 500, 600, and 650° C., with rough and polished surfaces. It was found that the torsion strength of polished specimens is higher than that of rough surfaces, particularly in the annealing range between 300 and 600° C.

3B-128. Ueber 12%-Mangan-Stahlguss. (Cast Steel Containing 12% Mn.) H. Resow. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Mar. 1949, p. 67-74.

Effect of carbon content, of other alloying elements, and of quenching

temperature on toughness and hardness. Tensile, impact, and compression tests were made to determine the type of working that produces maximum hardness and depth of hardness. Relationship of hardness on the wall thickness.

3B-129. Der Einfluss der Dehngeschwindigkeit auf die Zugfestigkeit und Dehnung austenitischer Stähle. (The Effect of Rate of Elongation on the Tensile Strength and Elongation of Austenitic Steels.) Wilhelm Puzicha and Alfred Krisch. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 93-98.

Investigated for three Cr-Ni and three Cr-Mn steels at rates of 0.4-150% per min. 15 ref.

3B-130. The Influence of Conditions of Heat Treatment and Hot-Cold Work on the Properties of Low-Carbon N-155 Alloy at Room Temperature and 1200 F. J. W. Freeman, E. E. Reynolds, D. N. Frey, and A. E. White. *American Society for Testing Materials,* Preprint 21, 1949, 28 pages.

Mechanical-property ranges were found to be greater than those resulting from wide variations in chemical composition, showing why it has not been possible to correlate composition of the Cr-Ni-Co alloys with properties at high temperatures.

3B-131. The Use of Metals at Low Temperature. S. L. Hoyt. *Metal Progress,* v. 55, June 1949, p. 821-826.

Metallurgical and mechanical factors involved in the selection of metals for use at low temperature, with emphasis on ferritic steels.

3B-132. Abrasive Wear of Metals. Roy D. Haworth, Jr. *Metal Progress,* v. 55, June 1949, p. 842-848.

Effects of different abrading materials, speed, pressure, impact, moisture, and heat on the wear of metals, especially hard steel and cast iron.

3B-133. Fracture of Gray-Cast-Iron Tubes Under Biaxial Stresses. R. C. Grassi and I. Cornet. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), June 1949, p. 178-182.

Investigated for various ratios of axial to tangential stress ranging from pure tension to pure compression, yielding data for some stress ratios not previously reported. Analysis reveals that present theories do not account completely for the data obtained.

3B-134. Boron-Titanium Steels for Moderate Temperatures. *Iron Age,* v. 163, June 16, 1949. p. 90-92. Condensed from "Ferritic Low Alloy Boron-Titanium Steel for Use at Moderately High Temperatures", by G. F. Comstock.

Results of experiments on 13 low-carbon steels which show effects of addition of various amounts of B and Ti on grain growth and mechanical properties at normalizing temperatures above 1625° F.

3B-135. Niedriglegierte Warmarbeitsstähle. (Low-Alloy Hot-Worked Steel.) Helmut Krainer, Karl Swoboda, and Franz Rapatz. *Archiv fur das Eisenhuttenwesen,* v. 20, Mar.-Apr. 1949, p. 111-114.

Hardenability, high-temperature tensile and impact strengths, heat conductivities, thermal-shock resistances, and general suitability of 40 low-to-average carbon toolsteels containing low percentages of alloying elements.

3B-136. Dauerstandversuche an einigen unlegierten Thomasstählen und hochlegierten hitzebeständigen Stählen bei 500 bis 900°. (Creep-Stress Experiments on Several Unalloyed Basic Bessemer Steels and High-Alloy Heat Resistant Steels at 500-900° C.) Anton Pomp and Alfred Krisch. *Archiv fur das Eisenhuttenwesen,* v. 20, Mar.-Apr. 1949, p. 125-134.

The creep-stress resistance of the above steels was determined by several different methods, under nine different conditions, and for periods exceeding 1000 hours. The various methods and the results are critically evaluated. 53 ref.

3B-137. Warmverformtes Gusseisen — Ein universal verwendbarer Werkstoff. (Hot Worked Cast Iron—A Universally Useful Material.) E. Piwowarsky and A. Wittmoser. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Apr. 15, 1949, p. 183-185.

Properties and uses.

3B-138. Ueber thermisch-beständiges Gusseisen. (Heat-Resistant Cast Iron.) Gerhard Clas and Karl Houben. *Die Neue Giesserei,* v. 36, (new ser., v. 2), May 1949, p. 131-138.

The main types of thermal stresses as well as the resulting physico-chemical reactions. The thermal behavior of cast irons alloyed with Cr, Al, and Si. 12 ref.

3B-139. Effect of Boron on the Structure and Some Physical Properties of Plain Cast Irons. Alexander I. Krynitsky and Harry Stern. *Journal of Research of the National Bureau of Standards,* v. 42, May 1949, p. 465-479.

Previously abstracted from *American Foundrymen's Societty.* See item 3B-67, 1949.

3B-140. Verhalten des Stahles bei erhöhten Temperaturen; Uebersicht uber das Schrifttum der Jahre 1944 bis 1947. (The Behavior of Steel at Elevated Temperatures; Survey of the Literature Published in the Years 1944-1947.) (Concluded.) Anton Pomp. *Stahl und Eisen,* v. 69, May 12, 1949, p. 339-342.

19 ref.

3B-141. Einflusse von sekundärer Biegung und inneren Drucken auf die Lebensdauer von Stahldrahtseilen. (Effects of Secondary Bending and Internal Pressures on the Life of Steel-Wire Cables.) Hermann Altpeter. *Stahl und Eisen,* v. 69, May 26, 1949, p. 381-385.

Theoretical and mathematical investigation of the problem.

3B-142. Zähigkeits- und Härtemessungen an Stahl bei tiefen Temperaturen. (Low-Temperature Tenacity and Hardness Measurements on Steel.) Alfred Krisch. *Stahl und Eisen,* v. 69, May 26, 1949, p. 386.

Recently reported German data obtained at temperatures of 20 to −183° C. on 12 carbon and low-alloy steels.

3B-143. Developments in Alloy Steels. E. Barber. *Canadian Mining Journal,* v. 70, June 1949, p. 71-73.

Details of the various test methods evolved simultaneously.

3B-144. Elastic and Fracture Toughness Studies of a Stainless Steel. Carl W. Muhlenbruch. *American Society for Testing Materials,* Preprint 24, 1949, 16 pages.

Type 301 sheet and rod of several tempers was shown to have great elastic and fracture toughness, the former being defined as the area under the stress-strain diagram at the yield strength and the latter as the same area at ultimate load. Theoretical fracture toughness thus determined is compared with values obtained from tension-impact tests. Results were found to agree within 14%.

3B-145. Static Properties of Cast Steels. Harry A. Schwartz. *Foundry,* v. 77, July 1949, p. 70-73, 184, 186.

Attempts to show which values of tensile strength, yield strength, elongation, reduction of area, and Brinell hardness can be expected simultaneously in cast steels given unlimited choice as to composition and heat treatment. Almost 100 steels were investigated in 5-25 heat treated states. Range of compositions to which the conclusions apply is approximately as follows: C, 0.24-0.52%; Si, 0.28-0.89%; Mn, 0.46-1.70%; Ni, trace to 3.35%; Cr, trace to 1.12%; Mo, trace to 0.49%; V, trace to 0.15%; and Cu, trace to 1.64%.

3B-146. Use of Tellurium in Promoting Chills on Gray Iron Castings. C. R. Austin. *Foundry,* v. 77, July 1949, p. 74-77.

Some of the properties and structural changes which may be induced by the controlled use of tellurium metal. Macrographs show fracture structures.

3B-147. Action du froid sur la contrainte réelle de rupture et la capacité de déformation de l'acier chargé en hydrogene. (Effect of Low Temperatures on the True Resistance to Fracture and on the Capacity for Deformation of Steel With a High Hydrogen Content.) Paul Bastien and Pierre Azou. *Comptes Rendus* (France), v. 228, Apr. 20, 1949, p. 1337-1339.

Stress-strain curves of annealed low-carbon steel (0.15% C) were determined between 15 and −70° C. Three cases were studied: steel under ordinary conditions, charged with hydrogen by electrolysis for 48 hr. in a solution of HCl, and charged by simple etching in this solution.

3B-148. Comportement mécanique des métaux polycristallins: analogie des facteurs fragilisants. (Mechanical Behavior of Polycrystalline Metals: Analogy of "Fragility Factors.") René Castro and André Gueussier. *Comptes Rendus* (France), v. 228, Apr. 20, 1949, p. 1339-1341.

Charted data (using six different low-alloy steel specimens) indicate the possibility of using a new factor designated as "fragility factor," which is a constant value for the given type of metal fully characterizing its mechanical properties.

3B-149. Influence du cuivre sur les caractéristiques d'un acier russe au chrome. (Influence of Copper on the Characteristics of a Russian Chromium Steel.) I. N. Latounzov. *Centre de Documentation Sidérurgique, Circulaire d'Informations Techniques,* v. 6, Feb. 1949, p. 67-69. Translated and condensed from *Stal* (Steel), v. 8, Mar. 1948, p. 255-258.

The influence of Cu additions on chemical and physical properties of a Cr steel (0.95-1.10% C; 0.20-0.40% Mn; 0.15-0.35% Si; 1.30-1.65% Cr; 0.3% max. Ni; 0.02% max. S and 0.027% max. P) was investigated.

3B-150. Selection of Heat Resistant Steels. I. J. B. Henry. *Product Engineering,* v. 20, July 1949, p. 113-118.

Factors influencing steels for high-temperature service include

strength, ductility, and fatigue resistance at operating temperatures, as well as resistance to oxidation and corrosion caused by other media in contact with the metal. (To be continued.)

3B-151. A Recent Development in Soft Magnetic Materials. H. H. Scholefield. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, June 1949, p. 207-209.

Development, manufacture, structure, and properties of a new magnetic material "H.C.R." (Ni-Fe), characterized by a rectangular hysteresis loop, particularly suitable for use in electronic circuits. Correlation of magnetic properties with preferred orientation.

3B-152. The Metallography and Properties of High Alloy Hot Work Steels. Peter Payson and A. E. Nehrenberg. "Yearbook of the American Iron and Steel Institute, 1948", p.540-570; discussion, p.570-574.

Data for two chromium and two tungsten hot work steels. Results are not considered conclusive, but as bases for development of improved materials. Mechanical properties, microstructures, transformation characteristics, and effects of heat treatment. 22 ref.

3B-153. Untersuchungen uber die Eignung von Chrom-Vanadin-Stählen fur Warm- und Schnellarbeitswerkzeuge. (Investigation of the Suitability of Chromium-Vanadium Steels for High-Temperature and High Speed Tools.) Winfried Connert, Eduard Maurer, and Robert Scherer. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 179-188.

Study of the Fe corner of the Fe-C-Cr-V constitution diagram. The properties of different tool compositions. 17 ref.

3B-154. Ruckdehnung beim Dauerstandversuch. (Elastic Elongation in the Creep-Stress Test.) Alfred Krisch and Anton Pomp. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 189-195.

Investigated in relation to time, temperature, and applied load for four different steels, the results frequently disagreeing with existing theories. 37 ref.

3B-155. Zur Frage des Spannungsabbaues durch Schwingungsbeanspruchung. (Concerning the Question of Stress Relief by Application of Alternating Stresses.) Helmut Neerfeld and Hermann Muller. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 205-210.

Experiments which show that above applied to steel bars considerably reduce their stresses and favorably affect their strength properties.

3B-156. The Addition of Tungsten to Cast Iron. J. E. Hurst. *Metallurgia,* v. 40, June 1949, p. 101-102.

Use of tungsten oxide reducing-agent additions and of high-speed steel as an addition agent. Apart from enhanced mechanical strength, the increase of elastic modulus, in both white and gray iron, as the W content increases, is worthy of note. Data are tabulated and charted.

3B-157. Molybdenum-Bearing Stainless Casting Alloy Has Wide Range of Uses. Norman S. Mott. *Materials & Methods,* v. 30, July 1949, p. 50-53.

Corrosion-resistant, physical, and mechanical properties of allov with improved corrosion resistance and increased strength at elevated temperatures. Applications. 13 ref.

3B-158. Resistance of a Gun Steel to Explosive Impact. F. Poboril. *Metal Progress,* v. 56, July 1949, p. 58-61.

Explosive toughness (measured by the powder charge needed to split a heat treated capsule) has a linear relationship to Charpy impact of the same steel at $-78°$ C., thus confirming Zener and Hollomon's thesis that the effect of very high speed of impact loading can be replaced by low temperature of a specimen tested at normal speeds.

3B-159. A New Low-Alloy Steel for High-Temperature Use. George F. Comstock. *Metal Progress,* v. 56, July 1949 p. 67-71. Condensed from "Ferritic Low-Alloy Titanium-Boron Steel for Use at Moderately High Temperatures".

Previously abstracted from *Iron Age,* item 3B-134, 1949.

3B-160. New Ductile Cast Iron Developed. *Skillings Mining Review,* v. 38, July 23, 1949, p. 6. Reprinted from *Nickel Topics,* Mar. 1949.

Properties of new cast iron. It is characterized by a graphite structure in the form of spheroids, free from graphite in the flake form.

3B-161. Aciers russes au chrome-silicium-cuivre et au chrome-silicium-aluminium réfractaires et résistants a chaud. (Russian Chromium-Silicon-Copper and Chromium-Silicon-Aluminum Heat-Resistant Steels.) M. P. Braun. *Circulaire d'Informations Techniques,* v. 6, Mar. 1949, p. 115-119. Translated and condensed from *Stal* (Steel), Jan. 1948, p. 60-64.

The influence of different alloying elements such as Si, Cu, and Al, and of heat treatment, microstructure and mechanical characteristics

of chromium steels. Chemical compositions of various test specimens and their mechanical properties.

3B-162. Influence of Size of Ferrite Grains on Strength of Iron and Steel During Brittle Fracture. (In Russian.) Yu. M. Potak and V. V. Sachkov. *Zhurnal Teknicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 399-407.

Proposes a new theoretical relationship between tensile strength of iron and grain size. Experimental investigation of low-alloy steels (0.25-0.51% C, 0.2-1.03% Si, 0.45-1.05% Mn, up to 1.42% Cr, 0.6-0.5% Mo, 0.64% Al, and 0.1% V) confirmed validity of the proposed formula.

3B-163. Variation of Damping Under Cyclic Stresses Below and Above the Fatigue Limit. (The Problem of the Physical Nature of Fatigue.) (In Russian.) L. A. Glikman, V. A. Zhuravlev, and T. W. Snezhkova. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 448-476.

Investigated using a specially developed apparatus on two low-carbon and one high-Cr stainless steel at different stress amplitudes above and below the fatigue limit. The influence of intermediate aging and annealing on the variations. 15 ref.

3B-164. Some Effects of Tension on Magnetization Processes. (In English.) K. H. Stewart. *Physica,* v. 15, Apr. 1949, p. 235-240.

Effects and their theoretical interpretation. Attempts to verify the latter by experimental work on the British "Hipersil" alloys.

3B-165. Magnetic Behaviour of Ferromagnetics at High Frequencies. (In English.) H. J. Van Leeuwen. *Physica,* v. 15, Apr. 1949, p. 258-263.

Results obtained at Delft, Holland, during the last few years, correlating them with the literature.

3B-166. Losses Due to Eddy Currents Caused by Magnetic Skin-Effects in Sheet Steel. (In Russian.) S. D. Margolin. *Doklady Akademii Nauk SSSR,* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 11, 1949, p. 665-667.

The method for determination of the above, ferromagnetic sheets being located in an alternating electromagnetic field. Formulas for calculation.

3B-167. Variation of Core Loss and Permeability of Electric Grade Silicon Sheet Steel. A. C. Beiler and P.-L. Schmidt. *American Society For Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 82-93; discussion p. 94-95.

Statistical methods were applied to the analysis of frequency distributions of core loss and permeability-test values obtained from suppliers' reports of single tests on 11,000 lb. lots of electrical sheet steel over a considerable period of time. Results indicate that variability within a lot of material is substantially the same as variability from lot to lot.

3B-168. Influence of Lead on Behavior of Stainless Steel. S. Bergh. *Iron Age,* v. 164, July 14, 1949, p. 96-99. Translated from *Jernkontorets Annaler,* v. 132, No. 6, 1948, p. 213-220.

3B-169. Selection of Heat Resistant Steels. II (Concluded.) J. B. Henry. *Product Engineering,* v. 20, Aug. 1949, p. 113-115.

Effects of extended exposure on mechanical properties; embrittlement; intergranular precipitation; thermal stresses; and relative costs.

3B-170. Chill Depth of Cast Iron Increased by Boron. *Steel,* v. 125, Aug. 15, 1949, p. 102, 104.

Previously abstracted from paper by A. I. Krynitsky and Harry Stern, *American Foundrymen's Society,* Preprint No. 47, 1949, item 3B-67, 1949.

3B-171. Effect of Carbon and Nitrogen on Temper Brittleness. D. C. Buffum, L. D. Jaffe, and W. P. Clancy. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 499-500.

Results of experiments on an iron alloy containing very little C or N indicate that temper brittleness cannot develop in their absence. However, two alternative explanations are possible.

3B-172. Deoxidation, Refining Processes Found to Affect Creep-To-Rupture Tests. G. V. Smith and E. J. Dulis. *Steel,* v. 126, Aug. 22, 1949, p. 99.

Previously abstracted from *American Society for Testing Materials,* Preprint 18, item 3B-119, 1949.

3B-173. Behaviour of Cast Steel at Elevated Temperatures. A. E. Johnson. *Engineer,* v. 188, July 29, 1949, p. 126-128; Aug. 5, 1949, p. 138-141; Aug. 12, 1949, p. 165-168; Aug. 19, 1949, p. 189-191, 193. From British Electrical and Allied Industries Research Association, Report J T 137: "The Behaviour of a Nominally Isotropic 0.17% C Cast Steel Under Combined Stress Systems at Elevated Temperatures".

About 80 tests consisting of pure tensile, pure torsion and complex stress-creep tests (the latter under various combinations of simple tensile and torsion stresses) at 350, 450, and 550° C. Extensive mathematical analysis.

3B-174. The Physics of Sheet Steel. 25. The Problem of Cyclic Magnetisation. (Continued.) G. C. Richer. *Sheet Metal Industries,* v. 26, July 1949, p. 1421-1426, 1436; Aug. 1949, p. 1661-1666.

July installment deals with cyclic domain structure. Aug. installment surveys problems in the measurement of ferromagnetic properties. 16 ref. (To be continued.)

3B-175. Fundamental Effects of Aging on Creep Properties of Solution-Treated Low-Carbon N-155 Alloy. D. N. Frey, J. W. Freeman, and A. E. White. *National Advisory Committee for Aeronautics,* Technical Note 1940. Aug. 1949. 71 pages.

Experimental procedure for establishing the fundamental mechanisms by which processing, heat treatment, and chemical composition control the properties of alloys at high temperature. The method relates microstructures and X-ray diffraction characteristics to creep and rupture test properties. Results of application to the above alloy and correlation with short-time creep and rupture characteristics at 1200° F.

3B-176. L'acier à 8-9% de Nickel: caractéristiques mécaniques aux basses températures; résistance à la corrosion. (Steel Containing 8-9% Nickel: Mechanical Properties at Low Temperatures; Corrosion Resistance.) P. Puel. *Métaux et Corrosion,* v. 24, Apr. 1949, p. 118. From *Revue du Nickel,* no. 2, 1949, p. 32.

Properties at temperatures as low as −200° C. Composition, optimum heat treatment, and mechanical properties are indicated in tabular form.

3B-177. Contribution à l'étude de l'influence des inclusions non métalliques sur la qualité des aciers. (Contribution to the Study of the Influence of Nonmetallic Inclusions on the Quality of Steels.) F. Eugène. *Revue de Metallurgie,* v. 46, Apr. 1949, p. 193-209.

Use of the Fremont etchant (10 g. of iodine and 20 g. of KI in 100 cc. of water). Application of this reagent to systematic control of the finishing of castings and forgings. Influence of inclusions on mechanical and physical properties. A statistical study of the relationship between the purity of a steel and its mechanical properties.

3B-178. Das Festigkeitsverhalten niedriglegierter warmfester Stähle und ihre Neigung zu verformungslosen Brüchen. (The Strength Behavior of Low-Alloy Heat Resistant Steels and Their Tendency to Brittle Fracture.) K. Richard. *Archiv für Metallkunde,* v. 3, May 1949, p. 157-164.

Critically examines the customary methods of testing fatigue-stressed heat resistant steels. Causes and remedies for brittle fracture as well as their relationship to other properties of steels. The need for long-time testing is stressed. 22 ref.

3B-179. Kluzne vlastnosti litiny na loziskova pouzdra. (Sliding Characteristics of Cast Iron as a Bearing Material.) Josef Doskar. *Hutnické Listy,* v. 4, Jan. 1949, p. 6-10; Feb. 1949, p. 45-48; Apr. 1949, p. 112-115.

Effect of composition, structure, and alloying elements on wear and mechanical properties of cast iron. For smooth running under small pressures, no differences could be found for different carbon contents. Copper and aluminum additions improve sliding characteristics, at the expense of mechanical and dynamical properties.

3B-180. Residual Stresses in Fe-Ni Alloys Partly Transformed From γ to α. (In Japanese.) Tadao Sano. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 19-22.

Residual stresses in alloys containing about 30% Ni were determined. The partial transformation was effected by immersion in various baths below 0° C. Results are summarized in English.

3B-181. Some Experimental Results for Notched and Bored Bars Under Repeated Loading. III. Effect of Surface Finishing Upon Fatigue Strength. IV. Relationship Between Diameter of Holes Perpendicular to the Axis of Bars and Their Fatigue Limit. (In Japanese.) Yuichi Kawada. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 33-39.

Part III: fatigue tests were made on 12 kinds of variously finished surfaces on Si-Mn-Cr steel with a tensile strength of 100 kg. per sq. mm. Results are summarized in English. Part IV: the relationship indicated above was investigated for Ni-Cr steel under repeated bending and torsion. It was found that quantitative recovery of fatigue limit is due to compression of the edge of the hole by the steel ball.

3B-182. Investigation of Timepiece Springs. I. (In Japanese.) S. Koshiba and K. Nobara. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 43-49.

Two kinds of 1% C steel were studied, one made from a magnetic ore and the other from scrap iron. Comparative mechanical properties and effects of cold rolling and heat treatment variables.

3B-183. Dynamic Vs. Static Properties of Low-Alloy Cast Steels. W. K. Bock. *Foundry*, v. 77, Sept. 1949, p. 72-74, 214-216, 219.

Results of investigation of 24 heats. Impact value, irrespective of composition, is related to both tensile strength and reduction of area. In quenched steels, the relation is close enough that there are no great differences of impact strength for given static properties. 15 ref.

3B-184. Progress Reports of Investigation of Railroad Rails, Joint Bars, and Manganese Steel Casting. R. E. Cramer and R. S. Jensen. Engineering Experiment Station, University of Illinois, Reprint Series No. 43 (*Bulletin*, v. 47, no. 1), Aug. 1949, 42 pages.

Previously abstracted from American Railway Engineering Association, *Bulletin*. See items 3B-29, 3B-32, 3B-34, 3B-36, and 22B-79, 1949.

3B-185. Beitrag sur Kenntnis der aluminiumlegierten Gusseisen. (Contribution to Knowledge Concerning Aluminum-Containing Cast Iron.) Heinz W. Uhlitzsch and Alfred Keller. *Die Neue Giesserei*, v. 36 (new ser., v. 2), Aug. 1949, p. 227-232.

Surveys the literature. Effect of Al on graphite content, mechanical properties, machinability, growth, and heat resistance of cast irons. A cast iron with more than 2.5% Si and 8% Al has good machining properties and high resistance to scaling at elevated temperatures. 26 ref.

3B-186. Effect of Sulphur on Quality and End Uses of Steel Products. M. Tenenbaum. *Blast Furnace and Steel Plant*, v. 37, July 1949, p. 802-806; *Iron and Steel Engineer*, v. 26, Aug. 1949, p. 98-99.

Previously abstracted from *American Iron and Steel Institute* Preprint. See item 3B-101, 1949.

3B-187. The Yielding and Strain-Aging of Carburized and Nitrided Single Crystals of Iron. Harry Schwartzbart. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 637-645.

Mechanisms of the phenomena were studied using single crystals of iron annealed in wet hydrogen to remove the carbon and nitrogen. These were cut into two specimens having the same orientation with respect to the tension axis. Results indicate that yield point in polycrystalline iron is not due to the presence of a grain-boundary film as has been frequently suggested. 19 ref.

3B-188. Selection of Steel for Automobile Parts. What Engineers Should Know Today About Hardenability Band Steels. Part II. Significance of Hardness. A. L. Boegehold. *SAE Journal*, v. 57, Sept. 1949, p. 25-28.

Graphs show approximate relationship of hardness to tensile strength. Hardness limits for important car components are superimposed on these graphs. Another graph shows relationship of strength of steel and service stress that can be imposed without premature failure. (To be continued.)

3B-189. "E" Steel. *Screw Machine Engineering*, v. 10, Sept. 1949, p. 40.

Faster, free-machining screw stock developed by Jones & Laughlin to step up production.

3B-190. Phénomène de Portevin-Le Chatelier dans les aciers doux et sa relation avec le vieillissement d'une éprouvette écrouie. (Phenomenon of Portevin-Le Chatelier in Soft Steels and Its Relation to Aging of Strain-Hardened Test Specimens.) Christian Boulanger. *Comptes Rendus* (France), v. 228, June 27, 1949, p. 2026-2028.

The phenomenon consists of the appearance of discontinuities on the stress-elongation curve due to the release of plastic deformation waves —associated with the property of blue brittleness. It was investigated for very soft steel wires (0.04% C). Kinetics and relation to aging are shown graphically.

3B-191. Endurance Limit of Steel Under Simultaneous Action of Constant and Alternating Stresses. (In Russian.) G. V. Uzhik. *Izvestiyå Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), May 1949, p. 657-665.

Investigated for two low-alloy steels. Diagrams for determination of endurance limits over a wide range of constant and alternating stresses acting simultaneously are proposed. Notch sensitivities were established at different points in the stress cycle. Relation between effective concentration of stress and notch sensitivity.

3B-192. Schwingungsuntersuchungen an hartverchromten Stäben. (Fatigue Tests on Hard-Chromium Plated Bars.) Walter Eilender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberflache*, v. 3, sec. A, Aug. 1949, p. A161-A163.

Tests show that reduction in the fatigue strength of bars is not caused by the hard-chromium plating itself, but by the fact that cracks in the plating roughen the surface of the plated material and thus cause a notch effect.

3B-193. Die Stahlauswahl für Tiefziehbleche. (The Selection of Steel for Deep-Drawing Sheets.) F. Eisenkolb.

Archiv für Metallkunde, v. 2, no. 7, 1948, p. 217-223.

Properties and methods of producing sheet steel suitable for deep drawing.

3B-194. Tensile Properties of a Heat Treated Low Alloy Steel at Subzero Temperatures. E. J. Ripling. *American Society for Metals,* Preprint No. 1, 1949, 14 pages.

Specimens of SAE 1340 were tempered at various temperatures between room temperature and 1100° F. Fracturing characteristics were plotted vs. testing temperature for the different tempering temperatures. Specimens tempered between 300 and 700° F. gave curves typical of materials with a transition temperature. Higher and lower temperatures gave almost linear relationships. 12 ref.

3B-195. Unnotched Impact Strength of High Speed Steels. Arthur H. Grobe and George A. Roberts. *American Society for Metals,* Preprint No. 4, 1949, 23 pages.

Unnotched Izod impact tests were conducted on nine different commercially available high speed steels and results compared with those obtained in the bend test of one of the steels.

3B-196. Effect of Boron and Kind of Boron Addition Upon the Properties of Steel. R. A. Grange, W. B. Seens, W. S. Holt, and T. M. Garvey. *American Society for Metals,* Preprint No. 5, 1949, 33 pages.

Samples from selected locations throughout each of 13 large commercial heats comprising AISI 1046, 1321, and 4150 grades of steel were investigated to determine the effect of boron, and kind of ferro-alloy in which it was added, upon uniformity of boron distribution, hardenability, austenite grain coarsening, susceptibility to temper embrittlement, and tensile and impact properties in each of several heat treated conditions.

3B-197. Characteristics and Properties of Cast Low Chromium-Molybdenum Steels. N. A. Ziegler, W. L. Meinhart, and J. R. Goldsmith. *American Society for Metals,* Preprint No. 6, 31 pages.

Some low-chromium-molybdenum cast steels recommended for their resistance to graphitization in superheated steam service were investigated for thermal characteristics, microstructures, physical properties, and weldability. 51 ref.

3B-198. Iron-Manganese and Iron-Manganese-Nickel Alloys. Irvin R. Kramer, Stewart L. Toleman, and Walter T. Haswell. *American Society for Metals,* Preprint No. 7, 1949, 33 pages.

Thermal and mechanical behavior of a series of these alloys was studied in order to develop alloys which, when slowly cooled from the austenitizing temperature, have strength and ductility properties equivalent to those of quenched and tempered steel. Additions of nickel stabilize the austenite so that this goal can be achieved. Behavior on tempering can be used to explain some of the embrittling effects which occur during the tempering of commercial steel.

3B-199. Metallurgical Factors Affecting the Magnetic and Mechanical Properties of Iron-Cobalt Alloys. J. K. Stanley. *American Society for Metals,* Preprint No. 8, 1949, 22 pages.

Metallurgical factors such as impurities (carbon and oxygen), grain size, and order-disorder were investigated with respect to magnetic quality and fabrication of 35-50% Co iron alloys. 14 ref.

3B-200. Stability of AISI Alloy Steels at Elevated Temperatures. A. B. Wilder and J. O. Light. *American Society for Metals,* Preprint No. 17, 1949, 19 pages.

Stability of over 100 different types at 900, 1050 and 1200° F. is being evaluated over a period of 10 years. Results obtained in an examination of 16 of these steels for evidence of structural changes, oxidation characteristics, and impact properties after exposure for 10,000 hr.

3B-201. Influence of Composition on Temper Brittleness in Alloy Steels. A. P. Taber, J. F. Thorlin, and J. F. Wallace. *American Society for Metals,* Preprint No. 22, 1949, 25 pages.

Effects of various amounts of Cr, Mn, Ni, and Mo in low and medium-alloy steels were determined. Significant variables, such as grain size, hardness, microstructure, steelmaking practice, forging direction and reduction, tempering temperature, and method of embrittlement were maintained as constant as possible. To attain maximum hardenability with the minimum temper brittleness, use of a steel containing at least 0.60-0.70% Mn and 0.25% Mo appears desirable. Combinations of Mn, Cr, and Ni seem preferable for higher hardenabilities. 19 ref.

3B-202. Creep and Rupture of Several Chromium-Nickel Austenitic Stainless Steels. G. V. Smith, E. J. Dulis, and E. G. Houston. *American Society for Metals,* Preprint No. 25, 1949, 46 pages.

AISI types 304, 316, 321, and 347 were investigated at 1100, 1300, and 1500° F. The nature of the microstructural changes occurring during test, the effect of these on certain mechanical properties, and the mode of fracture. 16 ref.

3B-203. The Effect of Sigma Phase on the Short-Time High-Temperature Properties of 25 Chromium, 20 Nickel Stainless Steel. Glen J. Guarnieri, James Miller, and Frank J. Vawter. *American Society for Metals,* Preprint No. 26, 1949, 22 pages.

Using a 25% Cr, 20% Ni stainless steel with 2% Si, high-temperature tensile and creep properties (up to 100-hr. duration) were correlated with type and pattern of sigma distribution. The hard sigma-phase constituent was found to increase materially the tensile and yield strength properties of the Cr-Ni steel up to approximately 1400° F., but a corresponding decrease in long-time creep strength properties occurred. The finely divided type of sigma structure was found desirable for minimizing room-temperature embrittlement as indicated by bend tests.

3B-204. A Study With New Equipment of the Effects of Fatigue Stress on the Damping Capacity and Elasticity of Mild Steel. B. J. Lazan. *American Society for Metals,* Preprint No. 28, 1949, 52 pages.

One of two new dynamic testing machines for damping measurements at high stress levels is a rotating cantilever beam machine. Test data indicate changes in capacity and dynamic modulus of elasticity of hot rolled mild steel during fatigue test. Two newly introduced terms, cyclic stress sensitivity and ultimate cyclic stress sensitivity, are used in analysis of dynamic ductility or notch-sensitivity concepts and fatigue specimen form factors. Exploratory tests on variable stress histories, overloading, underloading, rest, speed, and other variables. 17 ref.

3B-205. Bolted Joints Under Fatigue Loads. K. H. Lenzen. *Fasteners,* v. 6, no. 1, 1949, p. 6-9.

Fatigue tests. It was found that joints subjected to fully reversed cycles of fatigue loading may have unusually high fatigue strength.

3B-206. Magnetic Properties of Cast Stainless Steel. E. A. Schoefer. *Alloy Casting Bulletin,* no. 13, Aug. 1949, p. 1-4, 6.

Various cast alloy types, and reasons for their differences from wrought compositions. Shows that corrosion resistance is not a function of magnetic properties.

3B-207. Wrought Stainless Steels — Martensitic Type. *Materials & Methods,* v. 30, Sept. 1949, p. 93, 95.

Compositions; physical, mechanical, and fabricating properties; thermal treatments, corrosion resistance, available forms, and uses. A tabulation.

3B-208. Free Machining Steels—A Report on Ductility and Impact Resistance. W. Lee Williams. *Journal of the American Society of Naval Engineers,* v. 61, Aug. 1949, p. 543-553.

Experimental work on ductility and critical impact (embrittling) temperatures when steel is stressed in the direction of rolling. The first phase pertained to the study of nearly all types of commercially produced free-machining steels, treated as a general class, to determine whether sulfur and phosphorus are among the predominant influences on ductility and impact resistance. The second phase consisted of a study of three series of steels in which all known variables were held constant while the sulfur contents were changed.

3B-209. The Hot Tearing of Steel; A Review. J. M. Middleton. *Iron and Steel,* v. 22, Sept. 1949, p. 407-411.

Hot tearing occurs during casting of metals in the foundry and also in ingot casting. Causes, factors affecting this phenomenon and methods of testing for hot-tear susceptibility. 27 ref.

3B-210. Creep and Relaxation of Metals at High Temperatures. *Engineering,* v. 168, Sept. 2, 1949, p. 237-239. Condensed from "The Relaxation of a Chrome-Molybdenum Bolt Steel at Elevated Temperatures", and "The Relaxation of Two Low-Carbon Steels at Elevated Temperatures", both by A. E. Johnson, *British Electrical and Allied Industries Research Association,* Reports J/T144 and 145, 1949.

Analyzes effects of some of the factors which might influence creep at high temperatures. Validity of the analysis was checked against the results of relaxation and normal creep tests carried out at National Physical Laboratory, at temperatures up to 525° C. for periods up to nearly two years. Results indicate that, within the range of conditions applied, normal creep properties should not be used to predict relaxation characteristics; and that the time and strain hardening theories of creep considered are not entirely satisfactory.

3B-211. Kristallographische Vorgänge an der Fliessgrenze von Stahl und ihre Bedeutung für die Dauerfestigkeit. (Crystallographic Behavior at the Yield Point of Steel and Its Relationship to Fatigue Strength.) Franz Lihl. *Metall,* Dec. 1948, p. 391-396; Feb. 1949, p. 49-51.

Experiments made to determine the effect of fatigue stresses on the

structure of steel. X-ray diagrams, tables, and graphs. 10 ref. (To be concluded.)

3B-212. Aciers ferritiques pour turbines à gaz. (Ferritic Steel for Gas Turbines.) G. Wood and J. R. Rait. *Revue de Métallurgie,* v. 46, June 1949, p. 386-398.

A series of alloy steels was comparatively investigated, including some austenitic steels. (To be continued.)

3B-213. A Laboratory Evaluation of Some Automotive Cast Irons. Arthur B. Shuck. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 166-192; discussion, p. 192-193.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-11. See item 3b-59, 1948.

3B-214. Pearlitic Malleable Irons, Plain and Alloyed. Richard Schneidewind and D. J. Reese. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 410-429; discussion, p. 429-430.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-49. See item 3b-60, 1948.

3B-215. Tensile Properties vs. Composition of Double Normalized Cast Steel. H. A. Schwartz and W. K. Bock. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 446-451; discussion, p. 451.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-1. See item 3b-57, 1948.

3B-216. Effect of the Common Alloying Elements on the Tensile Properties of Malleable Iron. H. A. Schwartz and W. K. Bock. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 458-461; discussion, p. 461.

See abstract from *American Foundryman,* item 3b-66, 1948.

3B-217. Solved and Unsolved Problems in the Metallurgy of Blackheart Malleable. H. A. Schwartz. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A21-A28.

See abstract from *American Foundryman,* item 3b-83, 1948.

3B-218. Plastic Flow in Cast Iron, at Room and Elevated Temperatures, With Special Reference to Relief of Stress. C. R. Tottle. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A67-A72; discussion, p. A73-A75.

Previously abstracted from *Foundry Trade Journal.* See item 3b-201, 1948.

3B-219. Effect of Chromium Plating on the Endurance Limit of Steels Used in Aircraft. Hugh L. Logan. *Journal of Research of the National Bureau of Standards,* v. 43, Aug. 1949, p. 101-112.

Cr plating reduced endurance limits of both normalized and hardened SAE X4130 steels; reduction was larger for the hardened steel. Endurance limits for steel of given hardness decreased with increased plating-bath temperatures. Baking at temperatures up to 350° C. reduced the endurance limit; baking at 440° C. increased the limit for plated steel. Damaging effects of Cr are attributed to stresses which are increased by low-temperature baking, but are relieved in part by baking at 400-440° C. 14 ref.

3B-220. Influence of Strain Rate and Temperature on the Creep of Cold-Drawn Ingot Iron. William D. Jenkins and Thomas G. Digges. *Journal of Research of the National Bureau of Standards,* v. 43, Aug. 1949, p. 117-131.

Results of a similar study for Monel and oxygen free high-purity copper were previously reported. Since Monel and copper are face-centered cubic metals, the program was extended to include a study of the behavior of body-centered cubic iron as affected by variations in strain rate and in temperature.

3B-221. Selection of Steel for Automobile Parts. What Engineers Should Know Today About Hardenability-Band Steels. Part III. Steel Composition Related to Hardenability. A. L. Boegehold. *SAE Journal,* v. 57, Oct. 1949, p. 33-38.

Also slide rules for calculating hardenability curves from chemical composition. (To be continued.)

3B-222. Common Alloy Steels. Their Characteristics & Uses. *SAE Journal,* v. 57, Oct. 1949, p. 51-53, 60.

Metallurgical properties of commonly-used alloy steels (excluding stainless and austenitic) as well as some of their applications.

3B-223. Notch Sensitivity of Mild Steel Plates. A. B. Bagsar. *Welding Journal,* v. 28, Oct. 1949, p. 484s-506s.

Characteristics of several open-hearth, rimmed, semikilled, and killed steels of structural and pressure-vessel qualities, in the form of plates ¼-2¼ in. thick, were evaluated by use of several types of notched-bar tests. On the basis of the results, simplified testing procedures for establishing notch-sensitivity characteristics.

3B-224. General Engineering Types of Steel Castings Classified According to Tensile Strengths. *Tool Engineer,* v. 23, Oct. 1949, p. 38-39.

3B-225. The Physics of Sheet Steel. (Continued.) G. C. Richer. *Sheet Metal Industries,* v. 26, Oct. 1949, p. 2115-2120.

Anhysteretic vs. normal magnetization; and probability relationships.

3B-226. Einfluss von Sondernitriden auf die Eigenschaften von wolframarmen Schnellarbeitsstählen. (Effect of Special Nitrides on the Properties of Low-Tungsten High-Speed Toolsteels.) Franz Rapatz and Josef Frehser. *Stahl und Eisen*, v. 69, Aug. 18, 1949, p. 605-607.

Experiments with seven different steels show that the nitrides of Al, Zr, or Ti increase retention of hardness and, hence, life of toolsteels by 70-80%. 12 ref.

3B-227. (Book) **Hardenability and Steel Selection.** Walter Crafts and John L. Lamont. 260 pages. 1949. Pitman Publishing Corp., 2 W. 45th St., New York. $5.50.

Coordinated pattern of hardenability theories and calculations responsible for steel being purchased by hardenability instead of by chemical composition.

3B-228. Effect of Surface Roughness on Rolling Friction. J. J. Bikerman. *Journal of Applied Physics*, v. 20, Oct. 1949, p 971-975.

Minimum tilt at which bearing balls roll down an inclined plate of stainless steel is greater for rough than for smooth surfaces. The roughest surfaces gave almost quantitative agreement between height of elevations and height of hills calculated from a theory attributing rolling friction to surface roughness. No similar agreement was observed for fine finishes. Elastic deformation of the surfaces in contact was irrelevant for coarse finishes. Capillary attraction presumably did not interfere, as superficial drying had no effect.

3B-229. Change of Electrical Resistance During the Strain Ageing of Iron. A. H. Cottrell and A. T. Churchman. *Journal of the Iron and Steel Institute*, v. 162, July 1949, p. 271-276.

It has been suggested that yield point and strain aging of α-iron are due to migration of C and N atoms to dislocations. One consequence of the theory is that electrical resistance should decrease by a small and roughly predictable amount on strain aging. This effect is shown to exist in soft-iron wire. Effect of increasing the temperature of aging and increasing the amount of cold work. 22 ref.

3B-230. The Diffuse Reflectivity of Oxide Layers Formed on Steels Under Defined Conditions. R. J. Donato. *Proceedings of the Physical Society*, v. 62, sec. B, Oct. 1, 1949, p. 629-638.

Method to determine reflectivity at various wavelengths in the visible spectrum and at different temperatures up to 660° C. Some results are given for the oxides of various steels. Application to theory and practice (pyrometry) is indicated. 11 ref.

3B-231. A Clinical Diagnosis on a Springmaker's Malady — Acid Brittleness. *Mainspring*, v. 13, Oct. 1949, unpaged.

Practical analysis of the problem and its solution. Acid brittleness of steel, otherwise known as hydrogen embrittlement, is usually created by absorption during pickling, and can be removed by one of many suitable combinations of time and temperature.

3B-232. Overvoltage of Hydrogen on Porous Iron. (In Russian.) L. L. Kuz'min and V. S. Poroikova. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, June 1949, p. 572-577.

The reduction of hydrogen overvoltage on electrodes with built-up surfaces of porous iron obtained by powder metallurgy was investigated. Influence of conditions of electrode production on potential. At high current densities, hydrogen overvoltage is approximately 0.3 volt less than on smooth iron.

3B-233. Strength of Carbon Steels at High Temperatures. (In Russian.) M. A. Zaikov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 684-695.

Relationship of yield strength to temperature of annealing and melting point by experiments on fracture of test specimens of carbon steels containing 0.12-1.19% C. Formulas for computation of mechanical constants. Experimental method. Results for structural toolsteels for different temperature regions (20-1300° C.). 26 ref.

3B-234. Influence of Rate of Deformation on Strength of Carbon Steel at High Temperatures. (In Russian.) M. A. Zaikov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 711-721.

Experiments on fracture of steel (0.08-0.15% C) at different rates of deformation and different temperatures (20-1150° C.) establish relationship of yield strength and constant of plastic deformation to temperature and rate of deformation. Agreement of rate coefficient with previously determined relationship of yield strength to temperature and chemical composition of steel is indicated. 30 ref.

3B-235. Viscosity of Molten Iron-Carbon Alloys. (In Russian.) A. M. Samarin and L. A. Shvartsman. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the

Academy of Sciences of the USSR, Section of Technical Sciences), June 1949, p. 891-899.

Relationship to composition and temperature was investigated. Viscosity of molten iron may be predicted approximately by the theory of transition states. Applicability of formulas of Bachenskii for composition and temperature dependence of viscosity.

3B-236. Comparative Creep Characteristics of Type 14-14 Chromium-Nickel and Chromium-Manganese Steel. (In Russian.) A. M. Borzdyka. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), June 1949, p. 900-906.

Investigated on four samples of Type 14-14 steel with 2.5% W, two being Cr-Ni base and two Cr-Mn base. Each pair included a low-carbon and a medium-carbon steel. The Cr-Mn austenite was found to have much higher (10-20%) thermal stability than the Cr-Ni. Thermal stability of Cr-Mn steel of the austenite-ferrite type is shown to be directly dependent on relative content of alpha and gamma phases.

3B-237. Concerning the Properties of Hot-Quenched High Speed Steels. (In Japanese.) Masazo Okamoto and Mituru Nagakura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 31-34.

The above were investigated with respect to hardness, specific gravity, microstructure, thermal expansion, and specific resistance.

3B-238. Research on Austenitic Stainless Steel of the Ni-Cr-Mn System. (In Japanese.) Yoshitaro Fuke. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 34-37.

Purpose of investigation was to obtain alloys equal to 18-8 stainless in metallurgical properties, especially corrosion resistance, by addition of a fourth element. The elements Ti, Mo, V, Si, and Al were chosen for investigation. On this basis, 20 alloys were prepared and their mechanical properties and corrosion resistance determined. Results show superiority over 18-8 in two or three cases.

3B-239. How Chromium Plating Affects Fatigue Life of Aircraft Steels. *Steel*, v. 125, Nov. 7, 1949, p. 110-111, 142. A condensation.

Previously abstracted from *Journal of Research of the National Bureau of Standards*. See item 3B-219, 1949.

3B-240. La-Led: A New, Free-Machining Bar Steel. Glenn D. Boyer. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 38-40.

A cold finished openhearth steel containing lead and 0.08-0.13% C is said to realize large savings on a variety of screw-machine parts by replacing bessemer and resulfurized openhearth steels.

3B-241. Growth of Cast Iron. W. C. Blott. *Iron Age*, v. 164, Nov. 10, 1949, p. 88-91.

Growth characteristics of a series of high-strength cast irons used for parts which may be subjected to elevated temperatures. Effects of various alloying additions.

3B-242. Production Data Sheet. *Production Engineering & Management*, v. 24, Nov. 1949, p. 65.

General engineering types of steel castings classified according to tensile strengths. Includes specifications.

3B-243. Low Temperature Fatigue Tests on Steel. Hempel. *Product Engineering*, v. 20, Nov. 1949, p. 125-127. Condensed from *Wright-Patterson Air-Force Base, Headquarters Air Matériel Command*, Translation F-TS-1855-RE. Translated from *Kaiser Wilhelm-Institut für Eisenforschung*, ZWB Report FB 1704/1, Dec. 18, 1942.

Results of tensile, fatigue, notched-bar impact, endurance limit, and hardness tests on a series of 14 aircraft structural steels.

3B-244. Influence of Transition from Static to Dynamic Tensile Stress on Character of Plastic Deformation of Steel. (In Russian.) B. A. Krupitskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 831-834.

Character of distribution of plastic deformation among individual zones in the test specimen and the influence of transition from static to dynamic tensile stress on plastic deformation in these zones. Cr-Mo structural steel with different heat treatments was investigated as an example.

3B-245. Concerning the Dynamic Characteristics of the Magnetostrictive Alloy "Alfer". (In Japanese.) Hakaru Masumoto and Goro Otomo. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 1-4.

Dynamic characteristics of Fe-Al alloys containing 6.36-14.38% Al were measured in fields of 5, 10, 15, and 20 oersteds. The two curves representing the relationships of magnetostrictive activity and sound velocity to concentration in a field of 10 oersteds have maxima and minima, respectively, in the range 12.2-13.4% Al. A small addition of Ni greatly increases magnetostrictive properties.

Electro-acoustic efficiencies are of the same order as Ni—nearly 100%.

3B-246. Temper Brittleness of Si-Mn-Cr Steels. III. Effect of Manganese. IV. The Effect of Chromium. (In Japanese.) S. Koshiba and K. Nobara. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 30-36.

Effects of 0.6-1.2% Mn and Cr were investigated and found to increase rapidly with Mn content. Maximum temper brittleness occurs at a tempering temperature of 600-650° C. For Cr, "first temper brittleness" was observed at over 0.80% Cr. and "second temper brittleness" increases rapidly with Cr content. For 0.8-1.2% Cr, temper brittleness is very large at a tempering temperature of 600° C.

3B-247. Concerning Grain Growth and Cutting Durability of High-Speed Steel. (In Japanese.) S. Koshiba. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 36-40.

In high speed steel, grain growth is generally caused by "high" quenching temperature, value of the latter varying with heat treatment prior to quenching. Usually steel of smaller grain size is superior in cutting durability, but heat treating history must also be considered.

3B-248. Über die Temperaturabhängigkeit der Permeabilität und der Nachwirkung ferromagnetischer Werkstoffe. (The Temperature Dependence of Permeability and of After-Effect of Ferromagnetic Materials.) Hermann Fahlenbrach. *Annalen der Physik,* ser. 6, v. 2, June 15, 1948, p. 355-369.

Permeability vs. field strength and magnetic after-effects were measured for commercially "pure irons", and for Fe-Si, Fe-Ni, and Fe-Cr-Al alloys from 200° C. to the respective Curie points. A series of anomalous temperature ranges of permeability in which magnetic switch-off after-effects are found support Snoek's theory. With some exceptions, permeability values greatly increase with temperature up to near the Curie point. 11 ref.

3B-249. Influence of Cold Hardening by Application of Tensile Stress on Notch Plasticity During Bending. (In Russian.) P. O. Pashkov and M. D. Chernyshava. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, July 1949, p. 782-791.

The problem was investigated for 0.18% C steel. Results fully confirmed the theoretical explanation. The results could not satisfactorily be applied to other types of cold hardening, such as those induced by compression and torsion.

3B-250. Notch-Tensile Characteristics of a Partially Austempered, Low Alloy Steel. G. Sachs, L. J. Ebert, and W. F. Brown, Jr. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 424-435.

Previously abstracted from *Metals Technology.* See item 3b-25, 1948.

3B-251. Influence of Strain Aging on the Fracture Stress of Low-Carbon Steel. D. J. McAdam, Jr., G. W. Geil, D. H. Woodard, and W. D. Jenkins. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 436-446; discussion, p. 447.

Previously abstracted from *Metals Technology.* See item 3b-17, 1948.

3B-252. Anelastic Properties of Iron. T'ing-sui Ke. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 448-474; discussion, p. 474-476.

Previously abstracted from *Metals Technology.* See item 3b-92, 1948.

3B-253. Wear Tests on Grinding Balls. T. E. Norman and C. M. Loeb, Jr. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 490-520; discussion, p. 520-526.

Previously abstracted from *Metals Technology.* See item 3b-58, 1948.

3B-254. Behavior of Metal Cavity Liners in Shaped Explosive Charges. G. B. Clark and W. H. Bruckner. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 527-538; discussion, p. 538-540.

Previously abstracted from *Metals Technology.* See item 3-168, 1947.

3B-255. Plastic Flow in Anisotropic Sheet Steel. L. R. Jackson, K. F. Smith, and W. T. Lankford. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 415-429.

Previously abstracted from *Metals Technology.* See item 3b-142, 1948.

3B-256. Stabilization of the Austenite-Martensite Transformation. W. J. Harris, Jr., and M. Cohen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 447-470.

Previously abstracted from *Metals Technology.* See item 4b-84, 1948.

3B-257. The Magnetic Properties of Sintered Iron and Iron Base Alloys. W. Rostoker. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 672-693.

Previously abstracted from *Metals Technology.* See item 3b-187, 1948.

3B-258. (Book) **Zheleznye Splavy. Tom I. Splavy Zhelezo-Khrom-Alyuminii.** (Ferrous Alloys. Vol. I. Iron-Chromium-Aluminum Alloys.) I. I. Kornilov. 192 pages. 1945. Laboratory of Ferrous Alloys, Institute of General and Inorganic Chemistry, Academy of Sciences of the U.S.S.R., Moscow and Leningrad.

First volume of series of monographs. Physical and mechanical properties of different compositions in the Fe-Cr-Al system, and in the included binary systems; also the influences of fourth components. Modern production methods, including the aluminothermic process. Applications. 210 ref.

3B-259. What To Do About Temper Brittleness of Steels. Leonard D. Jaffe. *Steel,* v. 125, Nov. 21, 1949, p. 86-89, 114.

Recommendations for preventing appearance of temper brittleness, which is said to be much more prevalent than usually believed, on the basis of a critical review of recent research. 18 ref.

3B-260. Fatigue Limit of Chromium Plated Steel. *Iron Age,* v. 164, Nov. 24, 1949, p. 82. Based on *National Bureau of Standards,* Technical Report 1379.

In all cases tested involving specimens of SAE X4130 and 6130 rod, Cr plating was found to reduce fatigue limits, although the effect was less pronounced under some conditions than others. Three possible causes are discussed.

3B-261. Effect of Boron and Kind of Boron Addition Upon the Properties of Steel. R. A. Grange, W. B. Seens, W. S. Holt, and T. M. Garvey. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1337-1338.

Previously abstracted from *American Society for Metals,* Preprint No. 5, 1949. See item 3B-196, 1949.

3B-262. Mechanical Properties of Low-Carbon, Low-Alloy Steels Containing Boron. W. E. Bardgett and L. Reeve. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 277-294.

Test results in the normalized condition. The outstanding feature was the marked effect of Mo in the presence of B in enhancing maximum stress and yield stress. In a low-carbon Mo-B steel, the presence of the B almost doubled the yield stress with good ductility and toughness retained.

3B-263. Über unvollständig ausgesteuerte Magnetisierungsschleifen von Dauermagnetwerkstoffen. (Magnetization Curves of Unsaturated Permanent Magnet Materials.) Werner Jellinghaus. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 339-344.

Internal magnetization curves of nine different materials of very different magnetic properties were determined.

3B-264. Relazione fra il grado di saturazione e la velocità di raffreddamento nelle ghise ipoeutettiche. (Relationship Between Degree of Saturation and Cooling Rate of Hypo-Eutectic Cast Irons.) Cesare Bordoni. *La Metallurgia Italiana,* v. 41, July-Aug. 1949, p. 185-189.

Proposes formulas for determination of degree of saturation on the basis of cooling rate and thickness of casting. Relation between degree of saturation and mechanical properties of cast iron.

3B-265. Temperature Dependence of Coercive Force in Monocrystals of Transformer Steel. (In Russian.) Ya. S. Shur and K. B. Vlasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1081-1084.

Investigated along different crystallographic directions over a large temperature range (−195 to 400° C.) using monocrystalline disks differently heat treated (high-temperature annealing in hydrogen, cooling in a magnetic field, under magnetic screening, and aging). 6 ref.

3B-266. Effect of Sulphur on Quality and End Use of Steel Products. M. Tenenbaum. *Yearbook of the American Iron and Steel Institute,* 1949, p. 322-360; discussion, p. 361-365.

Previously abstracted from preprint. See item 3B-101, 1949.

3B-267. Effect of Sulphur on Steel Quality. *Industrial Heating,* v. 16, Nov. 1949, p. 1998, 2000. Condensed from paper by M. Tenenbaum.

See abstract from *American Iron and Steel Institute,* Preprint, item 3B-101, 1949.

3B-268. Some Engineering Aspects of Nodular Cast Iron. C. R. Austin. *Iron Age,* v. 164, Dec. 1, 1949, p. 79-85.

Aspects having particular influence on various applications. Microstructures and physical properties, and results of dynamometer tests of nodular-iron brake drums. Illustrated.

3B-269. Influence of Various Alloying Elements on the Tensile Strength and Yield Point of Steel Containing 0.1 Percent Carbon. *Production Engineering & Management,* v. 24, Dec. 1949, p. 69.

A graph.

3B-270. Engineering Steels Under Combined Cyclic and Static Stresses. H. J.

Gough. *Engineer,* v. 188, Oct. 28, 1949, p. 497-500; Nov. 4, 1949, p. 510-514; Nov. 11, 1949, p. 540-543; Nov. 18, 1949, p. 570-573.

A long-range investigation of the fundamentals of practical design of engineering components subjected to combined flexural and torsional stresses, of which the engine crankshaft is the typical example, was begun in the early thirties. Reversed and static bending and torsional stresses, singly and in various combinations, are the major variables. Fourteen steels and cast irons were investigated using a special combined stress-fatigue testing machine. 32 ref.

3B-271. Strain Aging; Change of Electrical Resistance. A. H. Cottrell. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 564-565; discussion, p. 607-608.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 3B-229, 1949.

3B-272. Boron; Effect on Mechanical Properties of Low-Carbon Low-Alloy Steels. W. E. Bardgett and L. Reeve. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 582-587; discussion, p. 601-602.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 3B-262, 1949.

3B-273. Champ coercitif et dimension cristalline. (Coercive Force and Crystal Dimensions.) Félix Bertaut. *Comptes Rendus* (France), v. 229, Aug. 8, 1949, p. 417-419.

Magnetic properties of iron powder are dependent largely on structure. The relationship between Bragg dimensions and coercive force.

3B-274. Existence dans le fer et l'acier d'une évolution réversible, à basse température, de la fragilité, due à l'hydrogène. (Existence in Iron and Steel of a Reversible Brittleness Transformation at Low Temperatures Due to the Presence of Hydrogen.) Paul Bastien and Pierre Azou. *Comptes Rendus* (France), v. 229, Sept. 12, 1949, p. 549-551.

Attempts to explain the anomalous behavior of brittleness in iron and low-carbon steel charged with hydrogen. There is a considerable decrease in brittleness below −110° C., which reappears on rise of temperature above this point. The explanation is based on the reduced internal pressure of the hydrogen at the lower temperatures, resulting in decrease of triaxial stresses.

3B-275. Laws of the Variations of Tensile Strength During Annealing of Steel. (In Russian.) S. Z. Bokshtein. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 651-654.

Variations of tensile strength of medium-carbon steel (0.40% C, 0.36% Mn, and 2.70% Si) were investigated over a wide range of annealing temperatures. Data indicate that tensile strength increases with temperature of annealing, reaching its maximum at 300-400° C., and then decreases with increasing temperature. Long-time annealing at 650° C. (25 hr.) results in a lower tensile strength than annealing for 1 hr. only. It is believed that this decrease in tensile strength with long-time annealing is caused by disintegration of the carbide phase with formation of graphite. 10 ref.

3B-276. Contribution to the Theory of Coercive Force of Soft Steel. (In Russian.) E. Kondorskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 37-40.

Theoretical analysis applicable to two general cases.

3B-277. Static Failure and Fatigue of Steels With Particular Reference to Welded Structures. M. Ros. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2417-2426, 2440; Dec. 1949, p. 2625-2656, 2658.

Theories proposed by Laboratoire Federal d'Essai des Materiaux, Zurich, Switzerland, to explain the above.

3B-278. The Use of Phosphorus in Plain Carbon Steel Hoop. R. W. Sandelin. *Wire and Wire Products,* v. 24, Dec. 1949, p. 1122-1124.

Effects of phosphorus, especially in barrel hoops. Mechanical properties are tabulated. Value for material requiring severe cold working.

3B-279. Flow and Fracture Characteristics of a Die Steel at High Hardness Levels. L. J. Klingler, C. C. Chow, and G. Sachs. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 927-932.

Investigation was conducted on an air hardening nondeforming die steel.

3B-280. Selection of Steel for Automobile Parts; What Engineers Should Know Today About Hardenability-Band Steels. Part V. Another Method of Hardenability Correlation. A. L. Boegehold, *SAE Journal,* v. 57, Dec. 1949, p. 29-31.

Another graphical method.

3B-281. Valve Type Related To Operating Needs. *SAE Journal,* v. 57, Dec.

1949, p. 71-73. Based on "Recent Trends in Engine Valve Design and Maintenance for Automotive and Diesel Engines", by Norman Hoertz and R. Max Rogers.

Properties of the various alloy types, with emphasis on their behavior in service (corrosion resistance, thermal resistance, physical and mechanical properties). Effects of design variations.

3B-282. A Practical Evaluation of Ductile Cast Iron. T. E. Eagan and J. D. James. *Iron Age,* v. 164, Dec. 8, 1949, p. 75-79; Dec. 15, 1949, p. 77-82.

In interim report based on a series of tests involving full-size castings. First installment: foundry practice, mass effect, heat treatment, and impact strength. Concluding installment: a series of bursting and endurance tests on full-size pressure vessels; properties of a conveyor part cast in ductile iron and other ferrous metals.

3B-283. An Introduction to Gases in Steel. Dennis J. Carney, John Chipman, and Nicholas Grant. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 34-45; discussion, p. 65-73.

Apparatus for determining gas solubilities in metal. Effect of water vapor on the solubility of H_2 in steel; and effects of H_2 on mechanical properties. 23 ref.

3B-284. Relationship Between Hydrogen Content and Ductility of Steels. Shadburn Marshall, T. M. Garvey, and D. S. Llewelyn. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 59-65; discussion, p. 65-73.

3B-285. Properties of Cast Iron in Relation to the Carbon Equivalent Value. H. T. Angus, F. Dunn, and D. Marles. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 24-44; discussion, p. 44.

Reviews previous attempts to find a relationship between analysis and mechanical properties of cast iron. 22 ref.

3B-286. Effect of Aluminum and Vanadium on Toughness of High Hardenability Cast Steels. J. F. Wallace. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 269-280; discussion, p. 280.

Previously abstracted from preprint. See item 3B-81, 1949.

3B-287. Effect of Boron on Structure and Some Physical Properties of Plain Cast Irons. A. I. Krynitsky and Harry Stern. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 475-487; discussion, p. 487-488.

Previously abstracted from preprint. See item 3B-67, 1949.

3B-288. Coercive Force of Hardened "ShKh15" Steel. (In Russian.) B. K. Vainshtein and B. G. Livshits. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 871-881.

Influence of residual austenite and martensite on physical properties of the above steel (1.07% C, 1.45% Cr, 0.42% Mn, 0.25% Si, and 0.03% P). It was found that the intensive growth of martensite occurring after solution of carbide does not influence coercive force and electrical resistance. Residual austenite is the main factor causing decrease of magnetic saturation and magnetic permeability. 10 ref.

3B-289. Toughness and Cold Brittleness in the Presence of Initial Static Stresses. (In Russian.) V. P. Degtyarev. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 882-891.

Studied for steels containing 0.53-2.61% C, 0.27-0.6% Mn, 0.18-2.69% Si, 0.013-0.1% S, 0.031-0.14% P, 0-8.5% Cr, and 0-0.8% Ni. Initial static compressive stresses increase toughness and decrease critical temperature of brittleness. Initial tangential static stresses also have the same effect on brittleness. Test apparatus and method of investigation.

3B-290. Seile für Spannbeton. (Cables for Prestressed Concrete.) Reinhold Baum. *Stahl und Eisen,* v. 69, Oct. 13, 1949, p. 740-744.

Concrete is prestressed to increase its tensile strength. Various methods of prestressing in 1, 2, or 3 axial directions; various types and sizes of steel cables used and their tensile and bending strengths when embedded in concrete.

3B-291. Dauerversuche an Schraubenfedern. (Long-Time Tests on Coil Springs.) Max Hempel. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 712-713.

Test results on alloy and carbon-steel springs. The tests were made at room temperature and at 250° C.

3B-292. Magnetische Untersuchungen an kohlenstoffarmen Eisen-Chrom-Legierungen. (Magnetic Investigation of Low-Carbon Iron-Chromium Alloys.) Hermann Fahlenbrach. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 293-299.

Alloys of iron containing up to 30% Cr, up to 7% Al, and up to 5% Si were studied for their permeability at small field strengths and their coercive force after heat treatments at 900 and 1100° C. Practical uses of the various alloys. 23 ref.

3B-293. Die mechanischen Eigenschaften von titanlegierten Blechen nach

Luftabkühlung aus der Walzhitze. (The Mechanical Properties of Titanium-Containing Sheets After Air Quenching From Rolling Heat.) Peter Bardenheuer and Wilhelm Anton Fischer. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 313-322.

Three test steels (0.4-1.2% Ti and 0.10% C) were melted in the electric-arc furnace; and one steel with 0.6% Ti in the openhearth furnace. They were rolled at different temperatures to 20 and 12 mm. thickness. Mechanical properties were determined at room temperature, 350 and 500° C. Macrostructures and outer appearances of test samples.

3B-294. Zug- und Kerbschlagversuche an Chrom-Nickel-Molybdän, Chrom-Molybdän- und Chrom-Vanadin-Stählen in der Wärme and Kälte. (Tensile and Notch-Impact Tests on Chromium-Nickel-Molybdenum, Chromium-Molybdenum and Chromium-Vanadium Steels at High and Low Temperatures.) Anton Pomp and Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 323-328.

One hundred forged and annealed specimens were investigated to determine differences between the recently developed alloys and those made in earlier years. 17 ref.

3B-295. Contribution à l'étude de la relation entre la structure micrographique et la résistance au fluage. Influence de la charge. (Contribution to the Study of the Relationship Between Microstructure and Creep Strength. Influence of Applied Load.) Georges Delbart and Michel Ravery. *Comptes Rendus* (France), v. 229, Oct. 17, 1949, p. 759-760.

Investigated for 0.6% Cr, 0.6% Mo steel with particular emphasis on the relationship between rate of creep and load applied at a given temperature.

3C—Nonferrous

3C-1. Delayed Fracture of Materials Under Tension, Torsion and Compression. C. Gurney and Z. Borysowski. *Proceedings of the Physical Society,* v. 61, Nov. 1, 1948, p. 446-452.

The materials tested were brass in ammonia vapor, polymerized methyl methacrylate in liquid CCl_4, and glass in air. Delayed fracture is attributed to the gradual spread of cracks caused by preferential attack by the surrounding medium of the highly stressed material at the ends of the cracks. In no case did delayed fracture occur in compression.

3C-2. Machinery's Data Sheets 625 and 626. Classifications and Compositions of Copper-Base Ingot Alloys. Physical Properties of Copper-Base Ingot Alloys. *Machinery* (American), v. 55, Jan. 1949, p. 245.

3C-3. Surface Effects with Single Crystal Wires of Cadmium. E. N. Da C. Andrade and R. F. Y. Randall. *Nature,* v. 162, Dec. 4, 1948, p. 890-891.

Results of some experiments on the effects of salt contamination on hardening and flow properties. If a single crystal with a clean surface is loaded so that it flows very slowly (at a rate of about 1% per hour), immersion in commercial cadmium plating solution (which contains potassium cyanide, cadmium potassium cyanide, sodium carbonate and sodium hydroxide) leads to an immediate increase of rate of flow, which may be anything up to twenty-fold. The fact that the effect is immediate seems to indicate that it is not caused by diffusion from the surface.

3C-4. The Superconductive Transition. C. K. C. MacDonald and K. Mendelssohn. *Nature,* v. 162, Dec. 11, 1948, p. 924.

Experimental results on very pure lead. No evidence was found (once the disturbing effect of geometrical shape is removed) for the theory that either discontinuous change of resistance or hysteresis are characteristic attributes of superconductive transition in a magnetic field.

3C-5. Determination of the Zero Point of Solid Metals on the Basis of Results of Measurement of the Capacity of the Double Layer. Lead. (In Russian.) A. Frumkin. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 925-929.

Attempts to apply the method of measuring the capacity in dilute solutions for the determination of the zero point of charge for solid metals. This point for lead was found to be —0.97 volts. 12 ref.

3C-6. Uber eine Sondererscheinung im Temperaturgang von Elastizitätsmodul und Dämpfung der Metalle Kupfer, Silber, Aluminium und Magnesium. (An Unusual Deviation in the Temperature Curve of the Modulus of Elasticity and Damping of the Metals Copper, Silver, Aluminum, and Magnesium.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 9-12.

The above metals show an unexpected lowering of the elasticity modulus and an increase in damping over a fairly wide temperature range. The amount of deflection de-

pends on the purity of the metals. Deoxidation or addition of deoxidizing elements eliminates these effects in copper and silver. The phenomenon is explained by the diffusion of foreign atoms in solution.

3C-7. Eigenschaften und Zustand galvanisch abgeschiedener Metalle mit höherem Gehalt an nichtmetallischen Fremdstoffen. (Properties and Condition of Electrolytically Produced Metals Having High Contents of Non-Metallic Impurities.) Ernst Raub. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 33-44.

The effect of nonmetallic inclusions on the properties of electrolytically produced Ag and Cu and effects of heat treating. Includes X-ray diffraction patterns and photomicrographs. 14 ref.

3C-8. Der Magnetisierungsvorgang bei einer Eisen-Nickel-Aluminium-Kobalt-Kupfer-Magnetlegierung mit Vorzugsrichtung. (The Magnetization Process in an Iron-Nickel-Aluminum-Cobalt-Copper Magnet Alloy With Preferred Orientation.) Werner Jellinghaus. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 52-56.

Specimens of the alloy were heated for 15 min. at 950° C. and cooled in a magnetic field. Magnetization, hysteresis, and apparent-remanence curves.

3C-9. Diagramma di durezza di un metallo. (Diagram of the Hardness of a Metal.) Vincenzo Montoro. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 173-175.

Possibility of determining the influence of stress on the microhardness of metals. Investigations on electrolytic copper, a Cu alloy (38.8% Cu, 61.2% Sn), and a remelted Al alloy showed a certain relationship between these two factors which may be expressed by an empirical formula.

3C-10. Uber das Kontaktrauschen. (Concerning Contact Noise.) Wilhelm Rump. *Metallforschung,* v. 2, May 1947, p. 138-144.

Causes of noises caused by uneven or defective contacts and by the opening and closing of electrical circuits. Observations on the behavior of gold, silver, platinum, tungsten, nickel, and alloys of noble metals with each other and with base metals with respect to noise.

3C-11. The Constitution and Properties of Alloys Containing Tantalum and Columbium. Rupert H. Myers. *Metallurgia,* v. 39, Dec. 1948, p. 57-63.

Supplement to an earlier paper, which reviewed literature on chemistry and metallurgy. Information which is available on alloys containing these metals. 67 ref.

3C-12. A Calculation of the Changes in the Conductivity of Metals Produced by Cold Work. J. S. Koehler. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 106-117.

The increase in the electrical resistance of severely cold worked metals was calculated by assuming that the important change which occurs during cold work is the introduction of large numbers of Taylor dislocations. The calculated increase for polycrystalline copper was in good agreement with the measured value. For single crystals, there is a decided dependence of the dislocation resistance on the orientation of the electric field relative to the crystallographic axes.

3C-13. Magnetic Susceptibility of Zinc at Liquid Helium Temperatures. S. G. Sydoriak and J. E. Robinson. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 118-131.

The de Haas-van Alphen effect in zinc was investigated at 4.2° K. by measuring the couple on a zinc crystal in a uniform magnetic field. Data obtained give the dependence of the susceptibility both on field strength and on orientation relative to the direction of the field. Results agree qualitatively with the theory of Blackman and Landau. Comparison of results with those of Marcus on zinc and Shoenberg on bismuth. 17 ref.

3C-14. What Are Carbides Good For? R. D. Mack. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 82-85, 100.

Various standard carbide shapes made by Carboloy Co., and their properties and applications.

3C-15. Some New Aspects of the Strength of Alloys. G. M. Schwab. *Research,* v. 2, Jan. 1949, p. 47-48.

Results of a fundamental study of metal hardness at elevated temperature as related to several factors such as electrical resistance, electron concentration, activation energy of catalytic action, and activation energy of plastic deformation at low temperatures. In order to evaluate the latter for Hume-Rothery alloys, measurements were performed at temperatures up to 460° C. on the systems Cu-Zn, Cu-Sn, Ag-Zn, and Ag-Cd.

3C-16. Ferromagnetic Resonance Absorption in Heusler Alloy. W. A. Yager and F. R. Merritt. *Physical Review,* ser. 2, v. 75, Jan. 15, 1949, p. 318.

Data for the alloy of 26% Mn, 61% Cu, 13% Al. Calculation of "g factor". Results compared with those reported in the literature for other metals and alloys. 10 ref.

3C-17. Influence de la constitution physicochimique des alliages cuivre-zinc sur les propriétés élastiques. (Influence of the Physicochemical Constitution of Copper-Zinc Alloys on Elastic Properties.) Robert Cabarat, Léon Guillet, and René Le Roux. *Comptes Rendus* (France), v. 227, Oct. 4, 1948, p. 681-683.

Cabarat's apparatus, first described in 1943, in which cylindrical samples are subjected to high-frequency longitudinal vibrations, thus permitting tracing of the amplitude curve of the vibrations as a function of the frequency of excitation, was used to determine Young's modulus and internal friction of the above alloys containing up to 30% Zn as a function of their composition.

3C-18. Changes in Electrical Resistance and Thermoelectric Forces in Longitudinal Magnetic Fields in an Ni-Mn Alloy as a Function of the Amount of Well-Oriented Phase. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), v. 61, Aug. 21, 1948, p. 1009-1012.

The above were investigated for 25 different samples of pure electrolytic Ni and Mn.

3C-19. Concerning Certain Peculiarities in the Superconductivity of Tantalum. (In Russian.) B. G. Lazarev and V. I. Khotkevich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 807-811.

Results of preliminary investigation indicate the high sensitivity of such properties of this metal to alterations of its lattice. The true critical parameter was obtainable only by use of a single-crystal specimen.

3C-20. Measurements at Low Temperatures and High Pressures. III. Superconductivity of Indium and Tin Under Multi-Directional Pressures of 1370 to 1730 Kg. per Sq. Cm. (In Russian.) L. S. Kan, B. G. Lazarev, and A. I. Sudovtsov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 825-832.

The above was investigated for polycrystalline indium and monocrystalline tin. It was found that displacements of the critical magnetic field decrease with decreasing temperature. Experimental methods and apparatus.

3C-21. Oscillograms of Disruption of Superconductivity by Audio-Frequency Currents. (In Russian.) A. A. Galkin and B. G. Lazarev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 833-836.

The maximum time necessary for transition of tin from the normal to the superconductive state, or conversely, was determined. Method of investigation and apparatus.

3C-22. Die elektrische Leitfähigkeit von mikrokristallinem hexagonalem Selen mit Thallium-Zusatz. (The Electrical Resistance of a Microcrystalline Hexagonal Selenium-Thallium Alloy.) Kurt Lehovec. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 278-285.

Investigates the d. c. resistance of hexagonal microcrystalline Se and its relationship to Th content and to previous treatment in the range from room temperature to the melting point. 10 ref.

3C-23. The Influence of Various Factors on the Creep of Lead Alloys. J. Neill Greenwood and J. H. Cole. *Metallurgia,* v. 39, Jan. 1949, p. 121-126.

Influence of steady stress at 20 and at 50° C. on lead-copper and lead-silver alloys. Influence of steady-stress vibration and previous heat treatment on alloys containing 0.075% Cu and 0.03% Ag, respectively.

3C-24. Cemented Carbides. Kenneth Rose. *Materials & Methods,* v. 29, Feb. 1949, p. 73-83.

Characteristics, properties, and uses of the various types. Attaching carbides to tools; grinding and polishing them; forming of the carbide pieces.

3C-25. Copper and Its Alloys. *Welding Journal,* v. 28, Feb. 1949, p. 161. Reprinted from *Tempil Topics,* v. 4, no. 1.

Properties compared with those of other common metals. Applications.

3C-26. Heat Capacities at Low Temperatures and Entropies of Vanadium Carbide and Vanadium Nitride. C. H. Shomate and K. K. Kelley. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 314-315.

The above were measured from 50.4 to 298.16° K.

3C-27. High Temperature Heat Contents of Vanadium Carbide and Vanadium Nitride. E. G. King. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 316-317.

The above were measured from about 400 to 1611° K. A table of heat content and entropy increments above 298.16° K. is presented, and heat-content and heat-capacity equations are derived.

3C-28. The Surface Tension of Solid Copper. H. Udin, A. J. Shaler, and John Wulff. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 186-190.

Rate and nature of flow of metal at temperatures approaching the melting point and under extremely low stresses. Importance in connection with powder metallurgy. 12 ref.

3C-29. The Effect of Alloy Additions on the Creep Strength of Zinc. F. Pawlek. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 303-308, 318.

Development of test methods for the above; influence of various alloys on creep strength. Fe, Ni, Co, Cr, and Mn are most important. Their phase transformations and the properties of Zn-Fe sheet made from refined zinc.

3C-30. NACA and Office of Naval Research Metallurgical Investigation of Two Large Forged Discs of S-590 Alloy. J. W. Freeman and Howard C. Cross. *National Advisory Committee for Aeronautics,* Technical Note No. 1760, Feb. 1949, 63 pages.

Study of properties of above material at room temperature, 1200, 1350, and 1500° F. to determine the level of properties obtainable in forgings required for rotor discs of gas turbines. Results for tensile, impact, rupture, time-deformation, creep, and structural-stability tests. 11 ref.

3C-31. Office of Naval Research and NACA Metallurgical Investigation of a Large Forged Disc of S-816 Alloy. Howard C. Cross and J. W. Freeman. *National Advisory Committee for Aeronautics,* Technical Note No. 1765, Feb. 1949, 45 pages.

Properties of large discs of S-816 alloy for as-forged and aged condition and heat treated and aged condition determined by stress-rupture and creep tests for time periods up to 2000 hr. at room temperature, 1200, 1350, and 1500° F. Short-time tensile-test, impact-test, and time-deformation characteristics. 10 ref.

3C-32. Notiz zum Verhalten von Kupferblechen in Mercurosalzlösungen verschiedener Hg-Konzentration. (Note on the Behavior of Copper Sheets in Mercury-Salt Solutions of Different Mercurous-Ion Concentrations.) Friedrich Muller and Hellmut Reuther. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 51, Jan. 1948, p. 44-45.

Study of photomicrographs indicates that none or a very limited amount of amalgam is deposited on sheets of copper immersed in very dilute solutions containing mercurous ions.

3C-33. Zur Oberflächenenergie fester Metalle. (The Surface Energy of Solid Metals.) R. Fricke. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, Mar. 1948, p. 72-75.

A comparison of calculated surface energies of solid metals with experimentally determined surface stresses in the respective liquid metals. Data are tabulated for 13 nonferrous metals of three crystal types. 14 ref.

3C-34. Contact Bridge Erosion and Its Prevention. W. G. Pfann. *Electrical Engineering,* v. 68, Mar. 1949, p. 197. Digest of "Bridge Erosion in Electric Contacts and Its Prevention." (To be published in *AIEE Transactions,* v. 67, 1948.)

Mechanism, physical appearance, and minimization of the above, which takes place on breaking of electrical contacts.

3C-35. The Size-Variation of Resistivity for Mercury and Tin. E. R. Andrew. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 77-88.

Measurements were made of the low-temperature resistivity of mercury wires down to 6μ diameter and of rolled tin foils down to 3μ thickness. A continuous increase of resistivity with decrease of diameter and thickness was considered due to a shortening of the mean free path of the conduction electrons by inelastic collision with the boundary surfaces of the metal. 13 ref.

3C-36. Critical Field Measurements on Superconducting Tin Foils. E. R. Andrew. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 88-95.

Determined from resistance measurements in a longitudinal magnetic field. Pomeranchuk's relation between foil critical field and the foil thickness was verified, and values of length were found as a function of temperature. 14 ref.

3C-37. A Note on Magnetic Viscosity in Alnico. R. Street and J. C. Woolley. *Proceedings of the Physical Society,* v. 62, sec. B, Feb. 1, 1949, p. 141-142.

The above phenomenon may be satisfactorily accounted for by assuming that, after a sudden change in an external magnetic field applied to the specimen, movement of the domain magnetization vectors is restricted by energy barriers.

3C-38. On the Compressibility of Metallic Cesium. R. M. Sternheimer. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 888-889.

Explains the break in the volumetric-compressibility curve of cesium at 45,000 kg. per sq. cm., on the basis of electronic structure.

3C-39. Electrical Properties of Pure Silicon and Silicon Alloys Containing Boron and Phosphorus. G. L. Pearson and J. Bardeen. *Physical Review,* ser. 2, v. 75, Mar. 1, 1949, p. 865-883.

Electrical resistivity and Hall measurements were made from 87 to 900° K. on pure Si and Si alloys containing 0.0005-1.0% B or P. X-ray measurements indicate that both elements replace Si in the lattice. Temperature variation of the concentrations of carriers, electrons and holes, and of their mobilities, are determined from resistivity and Hall data for the different samples. 21 ref.

3C-40. Collective Electron Ferromagnetism. III. Nickel and Nickel-Copper Alloys. E. P. Wohlfarth. *Proceedings of the Royal Society,* ser. A, v. 195, Feb. 3, 1949, p. 434-463.

The collective electron treatment is applied to the magnetic and thermal properties of the above alloys. Theoretical background. Variation of the specifying parameters, band width, and interchange interaction, for Ni-Cu alloys, over a wide range of composition. Dependence of electron distribution on temperature. Other temperature effects. Significance of the treatment on electronic heat at high temperatures. 33 ref.

3C-41. Theory of Superconductivity. Kai Chia Cheng. *Nature,* v. 163, Feb. 12, 1949, p. 247.

One can obtain a theory of superconductivity by considering the fact that interaction of electrons with the ionic lattice is appreciable only near the boundaries of Brillouin zones, and particularly strong near the corners of these, indicating that the metal should be superconductive if a set of corners of a Brillouin zone is close to the Fermi surface. This theory explains the fact that the superconductive elements lie exclusively in two columns of the periodic table. A rule for prediction of the superconductivity of alloys and compounds.

3C-42. Vérification de la théorie de Néel pour le champ coercitif des ferronickels en poudre fine. (Verification of Neel's Theory of the Coercive Field of Fine Powdered Ferronickels.) Louis Weil. *Comptes Rendus* (France), v. 227, Dec. 20, 1948, p. 1347-1349.

Experimentally verifies Neel's theory for ferronickels containing 50-90% Ni.

3C-43. Influence de l'état de surface sur la conductibilité des contacts. (Influence of the State of Surface on the Conductivity of Electrical Contacts.) P. de La Gorce. *Journées des Etats de Surface,* 1946, p. 223-226.

Theoretical analysis. Data for Ni, Cu, and Al are interpreted for different surface conditions.

3C-44. The Sodium Tungsten Bronzes. I. Chemical Properties and Structure. M. E. Straumanis. *Journal of the American Chemical Society,* v. 71, Feb. 1949, p. 679-683.

"Tungsten bronzes" (yellow bronze, $NaWO_3$) have metallic properties although they are neither alloys nor intermetallic compounds. Chemical and physical properties; attempts to find the end of the solid-solution series.

3C-45. Thermal Conductivity of Superconductors. J. K. Hulm. *Nature,* v. 163, Mar. 5, 1949, p. 368-369.

Results of measurements of the specific thermal conductivity at liquid helium temperatures of a series of tin specimens, ranging from spectroscopically pure tin to alloys containing up to 4% Hg. A tantalum specimen was also measured.

3C-46. Deformation of Single Crystals of Tin in Solutions of Oleic Acid. D. S. Kemsley. *Nature,* v. 163, Mar. 12, 1949, p. 404.

Experiments of Rehbinder and coworkers were repeated as a prelude to further work on the effect of surface-active substances on metallic friction. Results show no such effect.

3C-47. Ferromagnetic Alloys in the System Copper-Manganese-Indium. Robert R. Grinstead and Don M. Yost. *Physical Review,* ser. 2, v. 75, Mar. 15, 1949, p. 984-985.

Results of thermal analyses.

3C-48. The Elastic Properties of Metallic Alloys. R. Cabarat, L. Guillet, and R. Le Roux. *Journal of the Institute of Metals,* v. 75, Feb. 1949, p. 391-402. Translated from the French.

Effect of constitution on elastic modulus and logarithmic decrement in Cu-Sn and Cu-Zn alloys. Method consisted of causing longitudinal vibrations in the specimens by electrostatic means thereby creating very small strains at a high frequency. 23 ref.

3C-49. Fundamental Considerations Concerning the Behavior of Bearings.

R. W. Dayton. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 4-22; discussion, p. 55-56; 137-139; 146-147.

Hydrodynamic lubrication and the failure of present theory; frictional and other properties of bearing materials in general; properties of specific conventional bearing materials, showing in what respects they meet or fail to meet ideal requirements. 14 ref.

3C-50. Some General Comments on Bearings. Carl E. Swartz. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 23-34; discussion, p. 55-56.

The important properties of an ideal bearing: low modulus of elasticity; high fatigue resistance; high corrosion resistance; medium melting point; and excellent wettability by lubricant. Examples of fatigue cracks and corrosion.

3C-51. Discussion of Satco Metal. R. J. Shoemaker. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 137-139.

Properties of above which is a Pb-base alloy containing 95-98% Pb with balance Ca, Sn, and other hardeners. Advantageous properties and applications.

3C-52. Bronze-Backed Bearings. B. J. Esarey. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 174-188; discussion, p. 205-207.

Compositions and properties of the various bronze and babbitt bearing alloys. Types of bearing, with respect to design and method of fabrication.

3C-53. The Selection of Bearing Materials. Arthur F. Underwood. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 210-222; discussion, p. 146-147.

Properties to be considered. Fatigue resistance, deformability, scoring resistance, and corrosion resistance are considered most important. Graph shows approximate importance of each factor for six major types of bearing materials.

3C-54. Messung der Absorptionskonstante von Gold im Ultraviolett und Sichtbaren. (Measuring the Absorption Constants of Gold in Ultraviolet and Visible Light Rays.) Wilhelm Elfers. *Zeitschrift fur Physik,* v. 125, Dec. 10, 1948, p. 276-277.

Determines the above by measuring the gradient of light rays passing through layers of electrolytically deposited and vapor-deposited gold. Results are considerably higher and more accurate than those obtained by the polarization method.

3C-55. Composition, Structure & Properties of Iodide Titanium. Felix B. Litton and Bruce W. Gonser. *Metal Progress,* v. 55, Mar. 1949, p. 346-347.

3C-56. Properties of Wrought Commercially Pure Titanium Prepared by Arc Melting & Casting. C. I. Bradford, J. P. Catlin, and E. L. Wemple. *Metal Progress,* v. 55, Mar. 1949, p. 348-350.

Physical, mechanical, and miscellaneous fabricating properties. Possible applications.

3C-57. Fatigue & Corrosion of Sintered & Rolled Titanium. W. Lee Williams and William C. Stewart. *Metal Progress,* v. 55, Mar. 1949, p. 351-353.

Data obtained on titanium made by the Bureau of Mines in the following forms; sheet 0.0625 in. thick and 6 1/16 in. wide, bar ⅞-in. diam., and wire 0.1265-in. diam. Possible applications.

3C-58. Engineering Properties of Sintered & Rolled Titanium. N. E. Promisel. *Metal Progress,* v. 55, Mar. 1949, p. 354-355.

Results of mechanical and spot-weld testing.

3C-59. Mechanical Properties of Wrought Titanium Alloys Made by Arc Melting or by Sintering. Howard C. Cross. *Metal Progress,* v. 55, Mar. 1949, p. 356-358.

Data confirm beneficial effects of C, O_2, N_2, Mo, W, and Cr. Additional work on effects of Cr, Mo, Ni, Cu, Pb, Mg, Si, Mn, V, Fe, and Co is under way. Changes in tensile properties of pure Ti and four of its alloys on cold rolling to 50% reduction.

3C-60. Properties of Binary Sintered & Rolled Titanium Alloys. E. I. Larsen, E. F. Swazy, L. S. Busch, and R. H. Freyer. *Metal Progress,* v. 55, Mar. 1949, p. 359-361.

Confined to alloys containing more than 90% Ti. Data on mechanical properties and electrical resistivity of alloys in the hot rolled, cold rolled and annealed conditions. Resistance to oxidation, formation of low-melting phases, and ease of hot and cold working. H_2, Be, B, Al, In, C, Si, Zr, N_2, V, O_2, Cr, Mo, W, Mn, Fe, Co, and Ni were investigated as additive elements.

3C-61. High-Temperature Properties of Titanium Alloy Castings. P. H. Brace and W. J. Hurford. *Metal Progress,* v. 55, Mar. 1949, p. 362-363.

Results of creep-rupture and tensile tests on alloys containing 30-50% or more of high-melting materials. Alloys comparing favorably with conventional high-temperature materials and considerably lighter

were obtained. Best yield strengths were obtained with Ti-Cr base (20-40% Cr) alloys containing Mo and W in 4-1 atomic ratio.

3C-62. Properties of Melted & Forged Titanium-Chromium Alloys. D. J. McPherson and M. G. Fontana. *Metal Progress,* v. 55, Mar. 1949, p. 366-367.

Induction-furnace-melted alloys were largely unsatisfactory; most of the work was done with arc-melted alloys prepared at Battelle Memorial Institute. Mechanical properties, acid and salt-solution corrosion; scaling characteristics; and microstructure as forged and after annealing and quenching.

3C-63. The Electrical Conductivity of Bismuth Fibers. I. Magneto Resistance and the Crystalline Structure. B. Donovan and G. K. T. Conn. *Philosophical Magazine,* ser. 7, v. 40, Mar. 1949, p. 283-296.

Experiments on the change of electrical resistance of bismuth in a magnetic field using specimens in the form of thin fibers. Variation of resistance as a function of orientation was studied in two main cases; fiber axis parallel and perpendicular to the axis of rotation. 18 ref.

3C-64. Physical Properties of Intermetallic Compounds of Constant Composition. (Mechanism of Conductivity of Mg_3Sb_2). (In Russian.) B. I. Bolmaks and V. P. Zhuze. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Dec. 1948, p. 1459-1477.

Specific electrical conductivity, Hall effect, thermal emf., and heat conductivity. Analysis of the data indicates that Mg_3Sb_2, a typical representative of the phases of constant composition, is a semiconductor, from the point of view of its electrical properties. 18 ref.

3C-65. Possible Zonal Structure of the Energy Spectrum of Mg_3Sb_2. (In Russian.) T. A. Kontorova. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Dec. 1948, p. 1478-1484.

Investigated by the method of "weakly-bound" electrons. The effect of local levels in an alloy. Theoretical bases of the problem. Apparently, the above investigated compound, at low temperatures, should be considered a metal with very low conductivity, but, at high temperatures, a semiconductor.

3C-66. Electrical Conductivity of the Zinc-Antimony System. (In Russian.) I. V. Mochan. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Dec. 1948, p. 1485-1493.

Electrical and thermal conductivities at the stoichiometric point using the method of Vekshinskii. Application of this method and apparatus used. Results indicate that the compound ZnSb is a semiconductor having bonds of nonmetallic character.

3C-67. Photoconductivity of Certain Intermetallic Compounds. (In Russian.) V. P. Zhuze, I. V. Mochan, and S. M. Ryvkin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Dec. 1948, p. 1494-1497.

Photoconductivity in the intermetallic compounds ZnSb and Mg_3Sb_2. Spectral distribution of the photoconductivity was determined. Investigation indicates the semiconductive nature of the compounds.

3C-68 Effect of Composition on Properties and Structure of Cast Monel. J. T. Eash and T. E. Kihlgren. *American Foundrymen's Society,* Preprint No. 9, 1949, 10 pages.

Effect of changes in base composition, melting practice and certain impurities. Effect of Cu-Ni ratio, and Si, C, Mg, Pb, and Zr inclusions.

3C-69. Ferromagnetische Wechselwirkungen in Manganlegierungen. (Ferromagnetic Reciprocal Effects in Manganese Alloys.) L. Castelliz and F. Halla. *Acta Physica Austriaca,* v. 2, Feb. 1949, p. 348-355.

The magnetic susceptibilities of ternary Mn alloys, compared with the magnetic moments of atoms of Ni, Co, and Fe as measured by Sadron and Marian. The ε-phase of the Mn-Sb system was established by magnetic investigation of its structure.

3C-70. A Nickel-Aluminum-Molybdenum Creep Resistant Alloy. H. V. Kensey and M. T. Stewart. *Canadian Journal of Research.* v. 27, sec. F, Feb. 1949, p. 80-98.

Study of a series of these alloys to develop one for use under stress at 815° C. and above. Certain combinations of the three metals possess tensile strengths well over 100,000 psi. at room temperature; certain characteristic microstructures, dependent upon the Ni-Al ratio, are essential for these high strengths. Creep-rupture tests at 815° C. showed that some of these alloys are superior in many respects to existing high-temperature alloys.

3C-71. The Influence of Calcium on the Creep Characteristics of Lead. J. Neill Greenwood and J. H. Cole. *Metallurgia,* v. 39, Mar. 1949, p. 241-245.

Addition of small amounts of Ca

to Pb resulted in a marked reduction in creep rate, and although there are indications that aging occurs after rolling, the alloy is still superior to pure lead and copper-lead. Technical difficulties and methods for eliminating.

3C-72. Initial Investigation of Carbide-Type Ceramal of 80-Percent Titanium Carbide Plus 20-Percent Cobalt for Use as Gas-Turbine-Blade Material. Charles A. Hoffman, G. Mervin Ault, and James J. Gangler. *National Advisory Committee for Aeronautics,* Technical Note No. 1836, Mar. 1949, 49 pages.

Performance in a quasi-service gas-turbine unit. Alloy blades were used in the same unit for comparison. Elevated-temperature, short-time tensile, and thermal-shock investigations were conducted on the ceramal material. Results were encouraging. 10 ref.

3C-73. Magnetic Behaviour of Zinc and Cadmium at Low Temperatures. L. Mackinnon. *Proceedings of the Physical Society,* v. 62, sec B Mar. 1, 1949, p. 170-180.

The de Haas-van Alphen effect in zinc was investigated at liquid helium temperatures using a torsion method. Effect takes the form of a variation of susceptibility along the hexagonal axis which is periodic in the applied magnetic field. Although of similar structure, Cd did not show the effect.

3C-74. Permanent Magnets. James R. Ireland. *Machine Design,* v. 21, Apr. 1949, p. 153-160, 224-225.

Primary factors in the design of permanent magnets used to energize or control. Curves show variations of magnetic properties with dimensional ratios and with Alnico alloy composition.

3C-75. Office of Naval Research and NACA Metallurgical Investigation of a Large Forged Disc of Inconel X Alloy. Howard C. Cross and J. W. Freeman. *National Advisory Committee for Aeeronautics,* Technical Note No. 1770, Apr. 1949, 31 pages.

Properties were studied at room temperature, 1200, 1350, and 1500° F. in the solution-treated and aged condition. Results of tensile, impact, rupture, time-deformation, creep, and structural-stability tests.

3C-76. Titanium: A New Metal. George A. W. Boehm. *Scientific American,* v. 180, Apr. 1949, p. 48-51.

Properties, recovery methods, and present and potential applications.

3C-77. Beryllium Copper as a Spring Material. John T. Richards. *Machinery,* v. 55, Apr. 1949, p. 169-174.

Properties. Design changes desirable on substitution of Be copper for other materials.

3C-78. Uber die Verwendung von Glas als Elektrolyt bei Messungen elektromotorischer Kräfte an Legierungen. (On the Use of Glass as an Electrolyte for Determining the Electromotive Forces of Alloys.) Oswald Kubaschewski and Otto Huchler. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, Sept. 1948, p. 170-177.

The emf's of silver-gold alloys, with silver as the reference electrode, were determined between 300 and 600° C. The electrolyte was a Thuringian glass containing silver-ion. Objective of the experiments was to determine suitability of such glasses for this purpose. 29 ref.

3C-79. Anomalous Variations of Thermoelectromotive Force in the Magnetic Field of Ni-Mn Alloys. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Dec. 21, 1948, p. 639-640.

Variation of Thomson's transverse and longitudinal thermomagnetic effect with alloy composition. Charted data indicate that only pure nickel and its alloy with 5 atomic % Mn follow Akulov's second rule. In other cases Thomson's thermomagnetic effect has an anomalous character.

3C-80. Temperature Relationship of the Energy Constant to the Magnetic Anisotropy of Nickel. (In Russian.) L. V. Kirenskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 1, 1949, p. 53-56.

Investigated experimentally in the range from −183° C. to the Curie point, with emphasis on the range from 50° C. to this point. Method used.

3C-81. Surface Tension of Eutectic Alloys. (In Russian.) Yu. A. Kliachko and L. L. Kunin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 1, 1949, p. 85-86.

The surface tension of a series of liquid binary metallic systems containing various percentages of Pb, Sn, and Bi was investigated experimentally, using specially developed test apparatus, at a temperature very near the crystallization point. Alloys corresponding exactly to the eutectic compositions were used. 14 ref.

3C-82. Unique Among the Elements. *Inco Magazine,* v. 23, Spring 1949, p. 4-6.

Properties and applications of 99.4% Ni.

3C-83. Vaporization of Titanium. L. G. Carpenter and Frank R. Reavell. *Nature,* v. 163, Apr. 2, 1949, p. 527.

The rate of evaporation of titanium wires in vacuo was measured from 1650 to 1800° K. Results are expressed mathematically. Variation of total radiation with temperature was also determined.

3C-84. High Density Alloy With Strength and Machinability Developed From Tungsten-Nickel-Copper Combination. G. H. Denny. *Steel,* v. 124, Apr. 18, 1949, p. 101-102.

Development; production by the powder-metal technique; and applications.

3C-85. Hardness of Certain Peritectic Alloys as a Function of Composition, Structure, and Temperature. (In Russian.) A. M. Korolkov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 114-123.

Results of investigation for three series of alloys: Sn-Sb (Sn: 60-100%); Zn-Ag (Zn: 75-100%); and Cd-Ag (Cd: 80-100%). Data show that the character of their hardness variation may be different despite the fact that their constitutional diagrams are identical. 14 ref.

3C-86. Heat Resistance of Certain Binary Copper Alloys. (In Russian.) M. V. Zakharov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 124-130.

The influence of degree of heterogeneity on relative heat resistance of a series of alloys of the Cu-Zn, Cu-Sn, Cu-Al, and Cu-Be systems. Phase diagrams, upon which are superimposed curves of hardness vs. composition at various temperatures.

3C-87. Problem of the Influence of Demagnetization of an Alternating Field on the Galvanoelastic Effect in Nickel. (In Russian.) V. I. Zaitsev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Jan. 1949, p. 95-110.

Results of investigation. Marked influence of demagnetization by an alternating field. The existence of "galvanoelastic" hysteresis was established. Methods of investigation.

3C-88. Influence of Nonstabilized Magnetic Structure on the Hysteresis of the Galvanomagnetic Effect in Nickel. (In Russian.) V. I. Zaitsev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Jan. 1949, p. 101-104.

The possible cause of the anomalous shape of the hysteresis curve obtained by certain authors. Experimental method, test specimens used, and conditions of investigation. 11 ref.

3C-89. An Investigation of Creep, Fracture, and Bending of Lead and Lead Alloys for Cable Sheathing — Series 1946. Curtis W. Dollins. *University of Illinois, Engineering Experiment Station,* Bulletin Series No. 378, July 1, 1948, 90 pages. (*University of Illinois Bulletin,* v. 45, no. 65.)

Results of creep tests on strips and full sections of lead-cable sheathing. Lead alloys show considerable recovery during cyclic loading. Data are given which may account for the wide difference in the amount of creep obtained in laboratory tests and field tests. Stress-rupture tests in which loss of ductility as time for fracture is increased is very marked. Bending machines for testing the bending resistance of sheathing in strip form or extruded on cables. The marked superiority of the arsenical leads is shown by both strip and cable bend tests.

3C-90. Thermostat Metals. Unto U. Savolainen. "Engineering Laminates" (John Wiley & Sons, 1949), p. 351-381.

Properties of the various alloys used; methods of fabricaton; typical shapes; applications. 19 ref.

3C-91. Fatigue Properties of Some Coppers and Copper Alloys in Strip Form. H. L. Burghoff and A. I. Blank. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 709-732; discussion, p. 733-736.

Previously abstracted from preprint. See item 3c-37, 1948.

3C-92. The Effect of Small Percentages of Silver and Copper on the Creep Characteristics of Extruded Lead. G. R. Gohn and W. C. Ellis. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 801-814; discussion, p. 825-840.

Previously abstracted from preprint. See item 3c-30, 1948.

3C-93. Influence of Small Percentages of Silver on the Tensile Strength of Extruded Lead Sheathing. Howard S. Phelps, Frank Kahn, and William P. Magee. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 815-824; discussion, p. 825-840.

Previously abstracted from preprint. See item 3c-31, 1948.

3C-94. Specific Heats of Manganese and Bismuth at Liquid Hydrogen Temperatures. L. D. Armstrong and H. Grayson-Smith. *Canadian Journal of Research,* sec. A, v. 27, Mar. 1949, p. 9-16.

Reports measurements at 14-22° K. Results are compared with theory.

3C-95. The Tensile Strength of Titanium at Various Temperatures. R. L. Bickerdike and D. A. Sutcliffe. *Metallurgia,* v. 39, Apr. 1949, p. 303-304.

The literature and results of investigation. 16 ref.

3C-96. Calculation of Tensile Strength. *Metal Progress,* v. 55, May 1949, p. 690, 692, 694, 698, 700.

A critical summary of "Calculating the Tensile Strength of Metals and Its Dependence on Strain Rate and Temperature," Albert Kochendörfer, *Metallforschung* (previously abstracted from original item 3c-62, 1948). The reviewer indicates that the work does not bring us any nearer to theoretical understanding of the mechanical properties of metals and that the work is only a mathematical exercise based on doubtful assumptions.

3C-97. Ag-Mn Resistance Alloys. *Metal Progress,* v. 55, May 1949, p. 720.

Summarizes and critically discusses "Special Silver-Manganese Resistance Alloys," by Alfred Schulze, *Zeitschrift fur Metallkunde,* v. 34, 1942, p. 16-19. Binary Ag-Mn alloys with 9% Mn, annealed and slowly cooled, are said to have extremely desirable characteristics as resistance alloys for coils and shunts. The 8%-Mn, 7%-Sn alloy has a positive temperature coefficient of about 20 millionths at ordinary temperature, and no heat treatment under 200° C. changes it, while higher temperatures increase this factor slightly.

3C-98. Preparation and Properties of Some Gold Alloys. A. U. Seybolt. *U. S. Atomic Energy Commission,* AECD-2434; LADC-141, Sept. 30, 1943, 6 pages.

Samples of gold and five gold alloys were prepared and tested for hardness, yield strength in compression, and density. They contained approximately 5 and 10% Ni, and 10% each of Mn, Fe, and U. Microstructures.

3C-99. Resistance in the Intermediate State. E. R. Andrew. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 101-104; discussion, p. 127-128.

Theory and some resistance measurements with polycrystalline wires of spectroscopically pure tin. Some have been prepared by extrusion; others were drawn into glass capillaries. Both types behaved in the same manner.

3C-100. The Thermal Properties of Superconductors. J. G. Daunt. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 104-108.

Recent work and its theoretical interpretation.

3C-101. The High-Frequency Resistance of Superconducting Tin. H. London. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 109-112; discussion, p. 127-128.

Experimental data and their theoretical interpretation.

3C-102. Resistance of Superconductors at Microwave Frequencies. A. B. Pippard. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 113-118; discussion, p. 127-128.

Experimental results on tin and mercury.

3C-103. Some Measurements of the Electrical Resistance of Thin Metallic Films. A. Van Itterbeek. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 118-124; discussion, p. 127-128.

Data on films of Cu, Ag, Ni, Pb, and Bi made both by vacuum evaporation and by cathodic sputtering.

3C-104. Calorimetric Measurements on Normal and Superconductive Tantalum. Maurice Désirant. *Physical Society,* "Report of an International Conference on Fundamental Particles and Low Temperatures. Vol. II. Low Temperatures", 1947, p. 124-127; discussion, p. 127-128.

Experimental results obtained at the Kamerlingh Onnes Laboratory and the Clarendon Laboratory.

3C-105. Solid Solubility Effect of Metallic Surface Friction. Kwai Umeda and Yoshihiro Nakano. *Physical Review* ser. 2, v. 75, May 15, 1949, p. 1621.

Experimental results for a series of nonferrous alloys.

3C-106. Elastizitätsmodul und Dämpfung von Zink-Einkristallen. (Modulus of Elasticity and Damping of Zinc Monocrystals.) Gerhard Reinacher and Erich Scheil. *Zeitschrift*

fur Metallkunde, v. 39, Aug. 1948, p. 231-232.

Temperature dependence was determined for five differently oriented monocrystals.

3C-107. Eigenschaften und Anwendung metallischer Gleitlagerwerkstoffe. (Properties and Applications of Bearing Aloys.) Richard Weber. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 240-247.

70 ref.

3C-108. Uber eine neue Widerstandslegierung der Kupfer-Mangan-Gruppe fur Normalwiderstände. (A New Resistance Alloy of the Copper-Manganese Group for Normal Resistances.) Alfred Schulze. *Metall,* Sept. 1948, p. 291-295.

The alloy of the above group designated as 306, was investigated with rsepect to physical and electrical properties. Variations corresponding to different heat treatments.

3C-109. P-Type and N-Type Silicon and the Formation of the Photovoltaic Barrier in Silicon Ingots. J. H. Scaff, H. C. Theuerer, and E. E. Schumacher. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 383-388.

Electrical properties and preparation of the above semiconductors. Conductivity at room temperature results principally from the presence of metallic impurities. The effects of various impurities.

3C-110. The Influence of Vibration on the Creep of Lead. J. Neill Greenwood. *American Society for Testing Materials,* Preprint 29, 1949, 17 pages.

Creep tests on two industrial leads (both very pure) and two Pb alloys, one containing 0.027% Ag and the other 0.07% Cu, were made with 50 cycles per sec. vibration superimposed on direct tensile stresses of 100-350 psi. Vibration increases creep rate and accelerates recrystallization under stress. 13 ref.

3C-111. Magnetism in Copper Alloys: The Effect of Iron as Impurity. Allison Butts and Paul L. Reiber, Jr. *American Society for Testing Materials,* Preprint 34, 1949, 27 pages.

Magnetic susceptibilities and residual magnetic moments of 19 Cu alloys containing varying percentages of Fe as impurity were measured under different conditions of thermal and mechanical treatment. Data on which specifications may be based for maximum Fe content in alloys for the construction of instruments in which only weakly magnetic materials are permissible. A solution-quenching treatment lowered the magnetic properties of most of the alloys. A general pattern for increase in magnetism with Fe content was found. The correlation of magnetic properties with alloy composition. 10 ref.

3C-112. The Freezing Point of Uranium. A. I. Dahl and H. E. Cleaves. *U. S. Atomic Energy Commission,* AECD-2541, Mar. 22, 1949, 8 pages.

Reviews previous studies on physsical properties. Work on the freezing point of uranium. 10 ref.

3C-113. Effect of High Shear Rate on Erosion of Common Bearing Metals. Charles D. Strang and Thomas P. Clark. *National Advisory Committee for Aeronautics,* Technical Note No. 1887, June 1949, 25 pages.

Specimens of copper, silver, and lead were subjected to oil flowing at mean surface-shear rates of 1.5 x 10^6 reciprocal seconds for periods of 6 hr. Separate investigations were carried out with filtered and unfiltered oil. Apparatus.

3C-114. Pressure Change of Resistance of Tellurium. J. Bardeen. *Physical Review,* ser. 2, v. 75, June 1, 1949, p. 1777-1778.

The large change of resistivity with pressure is a result of a decrease in the energy gap, the gap becoming very small at 30,000 kg. per sq. cm. At a somewhat higher pressure (45,000 kg. per sq. cm.), Te undergoes a phase transition. The high-pressure modification may well be a true-metallic phase.

3C-115. Plaster-Mold Castings; Selections of Materials and Design Considerations. W. G. Wilkins. *Machine Design,* v. 21, June 1949, p. 114-118, 192, 194-195.

3C-116. Quelques données sur la conduction électrique des couches tres minces de divers métaux sur différents supports. (Some Data on the Electrical Conductivity of Very Thin Coatings of Different Metals on Different Bases.) Eugene Darmois, Nicolas Mostovetch, and Boris Vodar. *Comptes Rendus,* v. 228, Mar. 21, 1949, p. 992-993.

Results of an experimental study for coatings of W, Mo, Ta, Rh, Pt, and Ni on glass, mica, and fused quartz.

3C-117. Magnetic Structure of Highly Coercive Alloys. III. Curves of Magnetostriction of the Highly Coercive Alloys, Alnico and Vicalloy. (In Russian.) D. A. Shturkin and Ya. S. Shur. *Zhurnal Tekhnicheskoi Fiziki*

(Journal of Technical Physics), v. 19, Feb. 1949, p. 235-242.

Magnetostriction curves of these alloys. Their compositions and heat treatments were described in a previous article by the same authors for different conditions of the magnetic structure.

3C-118. Magnetic Susceptibility of the Intermetallic Compound Mg_2Sn. (In Russian.) B. I. Boltaks. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 487-489.

Investigated between —170 and 400° C. Dependence of magnetic susceptibility on deviation from stoichiometric composition and on temperature. Increase of diamagnetic susceptibility with temperature.

3C-119. Electrical Properties of the Intermetallic Compound Mg_2Sn. (In Russian.) B. I. Boltaks. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 653-656.

Were investigated, particularly the relationship of specific conductivity to temperature and to deviation from stoichiometric composition, variation of Hall effect with temperature, and thermal emf. Results indicate that Mg_2Sn may be classed as a semiconductor.

3C-120. Uber die Besonderheiten der Edelmetallegierungen im Schmuckgewerbe. (The Characteristics of the Noble Metal Alloys Used in Jewelry.) Josef Leuser. *Metall,* Apr. 1949, p. 105-110.

Color, hardness, structure, stress corrosion, and hardenability of Au-Ag-Cu alloys. Phase diagrams.

3C-121. Hartchromschichten höchster Verschleissfestigkeit. (Hard-Chromium Deposits of Maximum Wear Resistance.) Walter Eilender, Heinz Arend, and Eugen Schmidtmann. *Metalloberfläche,* v. 3, Mar. 1949, p. 57-59.

Results of experiments made to determine the correlation of hardness and wear resistance. Maximum wear resistance was found at Vickers hardnesses of about 750 kg. per sq. mm., with lessened resistance for both lower and higher hardnesses.

3C-122. Bildungswärmen Zintl'scher Erdelkaliverbindungen. XIII. Zur Thermochemie der Legierungen. (The Heats of Formation of Zintl's Alkaline Earth Compounds. XIII. The Thermochemistry of the Alloys.) O. Kubaschewski and H. Villa. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 53, Jan. 1949, p. 32-40.

Heats of formation of the systems B-Bi, Ba-Sb, Ba-Pb, Ba-Sn, Ca-Sn, Ca-Si, and Mg-Si were determined with a simplified adiabatic calorimeter. 35 ref.

3C-123. The Vapor Pressure of Tellurium and Selenium. L. S. Brooks. *U. S. Atomic Energy Commission,* AECD-2546, Sept. 10, 1948, 12 pages.

Results of measurement with quartz Bourdon gages. 16 ref.

3C-124. Die Einmundung in die magnetische Sättigung bei Nickel unter Zugspannung. (The Inception of Magnetic Saturation of Nickel Under Tensile Stress.) Otto Buhl. *Zeitschrift fur Physik,* v. 126, Apr. 4, 1949, p. 84-97.

The theory correctly expresses the measured constants of two nickel carbonyl specimens when one assumes, in addition to the tensile-stress zone, an area of disarranged internal plastic deformation stresses exceeding by several times the amount of external tensile stresses. 19 ref.

3C-125. The Electrical Conductivity of Germanium. E. H. Putley. *Proceedings of the Physical Society,* v. 62, sec. A, May 1, 1949, p. 284-292.

Measurements. The results are explained by the theoretical calculations of Shifrin and are used to deduce the concentration of impurity centers and of thermally excited electrons and the position of the impurity levels.

3C-126. Konstitution und Farbe des kolloiden Goldes. (The Constitution and Color of Colloidal Gold.) Wolfgang Pauli. *Helvetica Chimica Acta,* v. 32, May 2, 1949, p. 795-810.

Experimental methods and reported results. 46 ref.

3C-127. Metastable States of Nickel. J. J. Knight. *Nature,* v. 163, May 28, 1949, p. 839-840.

In view of a recent communication by Snoek and Fast on metastable states in well-annealed nickel, a similar effect noted during some investigations on nickel magnetostrictive oscillators is described. Suggests possibility that these metastable conditions can be employed for a highly efficient magnetostrictive transducer, which could be used in special circumstances.

3C-128. The Elimination by Lithium of Bismuth Embrittlement in Deoxidized Coppers and Copper Alloys. W. A. Baker and A. P. C. Hallowes. *Journal of the Institute of Metals,* v. 75, May 1949, p. 741-758.

Of a number of elements including Ce, Mg, and the alkali metals,

which form compounds with Bi, only Li was found to provide substantial freedom from embrittlement in notched-bar tests on nonarsenical Bi-containing Cu. The optimum range of Li contents, and the effect of Li additions to deoxidized arsenical coppers and a number of Cu alloys containing Bi. The chemical method for determination of Li in nonarsenical coppers and a note on spectrographic determination.

3C-129. Elasticity of Zinc Crystals. C. A. Wert and E. P. T. Tyndall. *Journal of Applied Physics,* v. 20, June 1949, p. 587-589.

Young's modulus was measured by dynamic and static methods for 25 Zn single crystals. 1/E is plotted against the square of the cosine of the orientation. From constants of the resulting curve and earlier data on linear compressibility by Bridgman, numerical values for the coefficients of compliance are derived. Data on three crystals were taken from room temperature to 375° C., which makes possible computation of Young's modulus for any orientation and any temperature in the range given. 12 ref.

3C-130. Inelastic Scattering of Low Speed Electrons From a Copper Single Crystal. Paul P. Reichertz and H. E. Farnsworth. *Physical Review,* ser. 2, v. 75, June 15, 1949, p. 1902-1908.

Energy distribution of inelastically scattered electrons from a (100) face of a copper single crystal was investigated by the electrostatic-deflection method.

3C-131. Elastic Constants and Internal Loss of Single Nickel Crystals. R. M. Bozorth, W. P. Mason, H. J. McSkimin, and J. G. Walker. *Physical Review,* ser. 2, v. 75, June 15, 1949, p. 1954-1955.

Velocities and approximate attenuations as measured for two nickel crystals.

3C-132. Solubility of Protactinium in the Common Acids. Roy C. Thompson. *U. S. Atomic Energy Commission,* AECD-2488, Oct. 7, 1946, 4 pages.

Study of the above in HNO_3, HCl, H_2SO_4, $HClO_4$, and HF leads to the conclusion that solubility may be attributed largely, if not entirely, to formation of complex ions.

3C-133. Sur le trainage magnétique des métaux massifs. (Magnetic "Drag" of Massive Metals.) Israel Epelboin and André Marais. *Comptes Rendus* (France), v. 228, Mar. 28, 1949, p. 1110-1112.

Proposes a variation of the Euler equation for determination of the above. This formula also permits determination of other variables such as permeability and the characteristic coefficients α and β of the magnetic structure. Curves for permeability as a function of percentages of dissolved and unpolished sections are presented for 76% Permalloy and Mumetal.

3C-134. Ceramic-Metal Alloy Has Thermal Shock Resistance Needed for Turbine Blades. *Product Engineering,* v. 20, July 1949, p. 150-151.

Investigation of an alloy containing 80% TiC and 20% Co conducted at the NACA Lewis Laboratory to determine resistance to thermal shock, short-time tensile strength at elevated temperatures, and performance characteristics under simulated service test conditions.

3C-135. Zirconium Metal, as of 1949. Iodide-, Magnesium-Reduced and Calcium-Reduced Zr. R. I. Jaffee. *Journal of Metals,* v. 1, sec. 1, July 1949, p. 6-9.

Analyses, mechanical properties, physical properties, and corrosion resistance. Covers only unalloyed Zr.

3C-136. The Comparative Creep Properties of Several Types of Commercial Coppers. A. D. Schwope, K. F. Smith, and L. R. Jackson. *Journal of Metals,* v. 1, sec. 3, July 1949 *(Metals Transactions,* v. 185), p. 409-416.

Effect of cold work on creep characteristics of tough-pitch and OFHC coppers, unalloyed and silver bearing, was determined for temperatures from 200 to 572° F.

3C-137. The Vapor Pressures of Zinc and Cadmium Over Some of Their Silver Alloys. C. E. Birchenall and C. H. Cheng. *Journal of Metals,* v. 1, sec. 3, July 1949, *(Metals Transactions,* v. 185), p. 428-434.

The above were measured over a temperature range of about 200° C. Thermodynamic activities and activity coefficients were calculated for the volatile component in each case. Free energies of solution for liquid Zn and Cd in solid Ag were computed for comparison with those of Cu-Zn. Free energies of these systems were compared with each other and Cu-Cd with respect to size factor, electronegativities, and the progression of stable phases in the phase diagram. 22 ref.

3C-138. Photoelectric and Thermionic Properties of Nickel. Alvin B. Cardwell. *Physical Review,* ser. 2, v. 76, July 1, 1949, p. 125-127.

The above properties of spectroscopically pure Ni were studied over a wide range of temperatures

including the Curie point, 350° C. Samples were studied after having been subjected to long outgassing processes. 13 ref.

3C-139. Different Explanations of the Influence of Additions on the Heat Resistance of Binary Copper Alloys. (In Russian.) M. V. Zakharov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Mar. 21, 1949, p.337-339.

Investigation of various binary and quasi-binary Cu-alloy systems indicates that they can be classified into three distinct types: those in which heat resistance decreases rapidly up to 500° C., and then decreases; those in which it continues to increase regularly even above 500° C.; and a combination type which may decrease near 500° C., but which increases again at higher temperatures on account of diffusion.

3C-140. Einsatz von Bleibronzelagern in Motorenbau. (The Use of Lead-Bronze Bearings in Engine Construction.) B. Garre. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 143-145.

Frictional properties of above bearings as compared with babbitt bearings. The behavior of babbitt metal, Ag, Pb-bronze, and Cu. Because of its hydrogen content, electrolytic Cu is found to have good frictional properties.

3C-141. The Electric Resistance of a Germanium Rod at Low Temperatures. (In English.) A. N. Gerritsen. *Physica,* v. 15, May 1949, p. 427-432.

Resistance was measured down to 1.6° K., in order to determine suitability of this material for resistance thermometry in the temperature region of liquid helium. It was found that the material is not very suitable for this purpose.

3C-142. Aimantation initiale d'un monocristal du composé défini Mn_2Sb suivant les axes de facile et difficile aimantation. (Initial Magnetization of a Monocrystal of Definite Composition Mn_2Sb Along Its Axes of Easy and Difficult Magnetization.) Charles Guillaud, Roger Bertrand, and Roger Vautier. *Comptes Rendus,* v. 228, May 2, 1949, p. 1403-1405.

A previous note (v. 227, 1948, p. 47 item 3c-84, 1948) gave results obtained with the cobalt monocrystal. It was shown that the quaternary axis is the axis of ready magnetization at room temperatures. However, in this paper it is shown that Mn_2Sb interchanges its axes of easy and difficult magnetization at about −33° C.

3C-143. The Embrittlement of Tough-Pitch Copper by Bismuth. A. P. C. Hallowes. *Journal of the Institute of Metals,* v. 75, June 1949, p. 839-854.

It is shown by notched-bar and tensile tests that if Bi-bearing tough-pitch Cu is rapidly cooled from a high temperature, then cold worked, and finally recrystallized by annealing at a low temperature, embrittlement occurs at the heat treatment temperature and persists at room temperature after cooling. Practical aspects of results and recommendations for avoiding embrittlement.

3C-144. The Fermi Gas Model Applied to the Thermal Electromotive Forces of Tin, Lead, and Indium. George C. Pimentel and Raymond K. Sheline. *Journal of Chemical Physics.* v. 17, July 1949, p.644-647.

The absolute thermoelectric powers of Sn, Pb, and In in the range 2-10° K. are taken from data of Keesom and Matthijs. The temperature dependence of thermal e.m.f. is parabolic, as predicted for a Fermi gas. Fermi energies of the three metals are calculated to be 5.72, 2.89, and 1.20 ev., respectively. Low temperature specific heat data then provide an estimate of the number of conduction electrons per atom. 16 ref.

3C-145. Ultrasonic Velocities of Sound in Some Liquid Metals. O. J. Kleppa. *Journal of Chemical Physics,* v. 17, July 1949, p.668.

Sound velocities and their temperature coefficients, adiabatic and isothermal compressibilities, densities, coefficients of thermal expansion, and specific heats for Na, K, In, Sn, and Hg. For the latter, data at 50 and 150° C. are given.

3C-146. Superconductors in Alternating Magnetic Fields. Robert T. Webber, J. M. Reynolds, and T. R. McGuire. *Physical Review,* ser. 2, v. 76, July 15, 1949, p. 293-295.

A simple technique of determining the superconducting transitions of small and irregularly shaped samples was applied to the determination of the transitions and critical magnetic field curves of Sn and V. 12 ref.

3C-147. Note on the Resistivity of Gold at Low Temperatures. C. T. Lane. *Physical Review,* ser. 2, v. 76, July 15, 1949, p. 304-305.

Measured by comparing electrical resistivity of an Au crystal with Bloch's model whose resistivity is zero.

3C-148. Magnetic Effects of a Rotating Superconductor. W. F. Love, R. F.

Blunt, and P. B. Alers. *Physical Review,* ser. 2, v. 76, July 15, 1949, p. 305.
Investigated for a superconducting tin rotor.

3C-149. Proton Stopping Power of Gold. Torben Huus and C. B. Madsen. *Physical Review,* ser. 2, v. 76, July 15, 1949, p. 323.
Proton resonances F-339 and Al-986 were used as energy indicators.

3C-150. Titanium . . . Its Prospects . . . Its Properties. R. I. Jaffee and I. E. Campbell. *Iron Age,* v. 164, July 28, 1949, p. 48-51.
Also considers metallurgical concepts in alloying and in applying the material to high-temperature service.

3C-151. Deformability of Copper-Nickel Alloys. (In Russian.) S. I. Gubkin and V. A. Golovin. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences) Mar. 1949, p. 421-425.
The deformability of nickel, Monel metal, German silver, and argentan (a Cu-Ni-Zn alloy). Comparative evaluation of these alloys with respect to their capacity for changing shape under compression. Experimental data fully confirm the theoretical assumptions.

3C-152. Variation of Superconductive Properties of Tantalum During Its Saturation by Hydrogen. (In Russian.) V. R. Golil, B. G. Lazarev, and V. O. Khotkevich. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Mar. 1949, p. 202-206.
It was proven that, during saturation of Ta by H_2, its temperature and magnetic-transition intervals widen markedly. In the case of high saturation, super-conductivity is not observed below 1.85° K.

3C-153. Mechanical Properties of a Silver-Copper Alloy (7-8% Cu) Under Tensile Stress. (In Russian.) G. N. Kolesnikov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 347-354.
Tensile strength diagrams from 20 to 100° C. were obtained in the hardened and aged conditions. Existence of "low-temperature" and "high-temperature" types of tensile-strength diagrams. Tensile-strength diagrams for the hardened condition are shown to have "saw-tooth" shape at temperatures of 150° C. and above. For both types of stress, dependence of resistance to deformation, yield strength, and elongation on temperature are indicated.

3C-154. Titanium-Chromium Alloys. D. G. McPherson and M. G. Fontana. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 12-17.
See abstract from *Metal Progress,* item 3C-62, 1949.

3C-155. Physical and Mechanical Properties of Commercially Pure Titanium. C. I. Bradford, J. P. Catlin, and E. L. Wemple. *Office of Naval Research.* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 49-58; discussion p. 58-59.
See abstract from *Metal Progress,* item 3C-56, 1949.

3C-156. Properties of Iodide Type Titanium. F. B. Litton. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 70-71; discussion p. 72.
See abstract from *Metal Progress,* item 3C-55, 1949.

3C-157. Some Preliminary Tests to Determine Applications for Titanium. W. Lee Williams. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 92-103; discussion p. 103-104.
See abstract from *Metal Progress,* item 3C-57, 1949.

3C-158. Some Preliminary Data on Alloys of Titanium. E. I. Larsen, E. F. Swazy, L. S. Busch, and R. H. Freyer. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 105-124; discussion p. 124.
See abstract from *Metal Progress,* item 3C-60, 1949.

3C-159. Titanium-Base Alloys. Howard C. Cross. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 125-131.
See abstract from *Metal Progress,* item 3C-59, 1949.

3C-160. Some Aspects of the Metallurgy of Titanium Alloys. P. H. Brace. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 132-142; discussion p. 142-143.
See abstracts from *Metal Progress,* items 2D-11 and 3C-61, 1949.

3C-161. Relationship of the Critical Temperature of Superconducting Alloys to its Pressure. (In Russian.) W. E. Alekseevskii. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Apr. 1949, p. 358-360.
Investigated for Bi_3Ni, Sn, and Bi_4Rh at pressures of 400-900 mm. Hg and 3.6-4.4° K. The displacement of critical temperature is toward lower temperatures in the case of Sn and higher temperatures in the cases of Bi_3Ni and Bi_4Rh. Method of testing.

3C-162. The High Frequency Resistance of Superconductors. (In English.) A. B. Pippard. *Physica,* v. 15, Apr. 1949, p. 40-44.

Theoretical implications of results obtained at two frequencies, 1200 and 9200 megacycles per sec. The work at the higher frequency still continues, fairly complete data having been obtained for tin, and less complete data for mercury.

3C-163. Measurements on the Electrical Resistivity of Thin Metallic Films. (In English.) A. Van Itterbeek and L. De Greve. *Physica*, v. 15, Apr. 1949, p. 80-82.

Results for nickel films produced by cathodic sputtering and vacuum deposition. The two pieces of apparatus.

3C-164. Mechanical Properties of Some Copper-Base Alloy Castings. F. C. Evans, W. A. Baker, G. T. Callis, and F. Hudson. *Foundry Trade Journal,* v. 87, July 7, 1949, p. 9-18; July 14, 1949, p. 39-44; July 21, 1949, p. 73-77.

Results of an investigation. Data are presented in a series of photographs or drawings which give the casting records with a table for each, summarizing properties determined in each of 25 cases in five groups: phosphor bronze, sand cast and chill cast (July 7 issue); lead-free and leaded gunmetals (July 14 issue); aluminum bronze and high-tensile brasses (July 21 issue).

3C-165. Some Anisotropic Properties of Gallium. R. W. Powell. *Nature* v. 164, July 23, 1949, p. 153-154.

Results of some electrical resistivity measurements, showing a maximum-minimum ratio of 7 with axial direction. Comparative data from the literature for Sb, Bi, Cd, Hg, Te, Sn, and Zn show much smaller values of this ratio, ranging from 1.04 for Zn to 2.75 for Te. 10 ref.

3C-166. Rhodium, A Precious Metal of Many Uses. *Journal of Chemical Education,* v. 26, Aug. 1949, p. 442-443. Reprinted from *Inco*, v. 22, Fall 1948.

Properties and applications.

3C-167. The Conductivity of Silicon and Germanium as Affected by Chemically Introduced Impurities. G. L. Pearson. *Electrical Engineering*, v. 68, Aug. 1949, p. 685-686.

Effects of minute amounts of B, P, and Sb. The amounts (for instance, one atom of B per million of Si) can only be detected by use of radioactive tracers and the Hall effect.

3C-168. The Work Function of Copper. Paul A. Anderson. *Physical Review,* ser. 2, v. 76, Aug. 1, 1949, p. 388-390.

Work functions and aging characteristics of 14 Cu surfaces were determined by measurement of their contact differences of potential with respect to barium reference surfaces of known work function. Measurement was by the retarding-potential method in tubes sealed from the pumps and gettered with vaporized barium. The Cu surfaces were prepared by subjecting "spectroscopic standard" copper to 40 vacuum fusions followed by fractional distillation, redistillation of the fractions, and condensation of the vapor on glass. The barium films were prepared by a similar, standardized technique.

3C-169. Magnetic Susceptibility of Zinc at Liquid Hydrogen Temperatures. Jules A. Marcus. *Physical Review,* ser. 2, v. 76, Aug. 1, 1949, p. 413-416.

Investigated in fields of 3-10.5 kilogauss. Measurements were made on single and polycrystalline specimens by the Faraday method. Results are compared with those for bismuth. 16 ref.

3C-170. Variation du champ coercitif du nickel reduit entre −253° C. et 150° C. (Variation of the Coercive Force of Nickel Reduced Between −253 and 150° C.) *Comptes Rendus*. v. 228, May 16, 1949, p. 1581-1582.

Results of experimental determination.

3C-171. The Subcooling of Liquid Metals. D. Turnbull. *Journal of Applied Physics,* v. 20, Aug. 1949, p. 817.

Experimental data on Hg and Ga droplets.

3C-172. Magnetic Properties of Metal Single Crystals at Low Temperatures. D. Shoenberg. *Nature,* v. 164, Aug. 6, 1949, p. 225-226.

In preliminary experiments on the magnetic anisotropy of single crystals, measured by a couple acting in a uniform magnetic field, the de Haas–van Alphen effect was found in Ga and Sn while negative results were obtained for Sb, In, Pb, and Ha in fields up to 9500 gauss and at temperatures down to 1.4° K. Some typical curves illustrate the behavior of Ga and Sn.

3C-173. The Variation of the Adiabatic Elastic Constants of KCl, NaCl, CuZn, Cu, and Al With Pressure to 10,000 Bars. David Lazarus. *Physical Review,* ser. 2, v. 76, Aug. 15, 1949, p. 545-553.

Measurements of elastic constants of single-crystal specimens of Cu, Al, CuZn, KCl, and NaCl subject to hydrostatic pressures up to about 10,000 kg. per sq. cm.

3C-174. Der Elastizitätsmodul und die Festigkeit von Hartchromschicten. (The Modulus of Elasticity and Strength of Hard Chromium Coatings.) Walter

Eilender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberfläche,* v. 3, sec. A, July 1949, p. A145-A147.

Experiments made to determine the above from the results of tensile and bending tests. Heating to 300° C. reduces the modulus of elasticity from 16,400 to about 13,000 kg. per sq.mm. The tensile strength of hard chromium was found to be 15 kg. per sq.mm., but its yield point could not be determined.

3C-175. Matériaux pour résistances électriques et éléments de chauffage. 2. Resistance de chauffage . . . Elektrische Widerstandsmaterialen und Heizleiter. 2. Heizleiter. (Electrical Resistance Materials and Heating Elements. 2. Heating Elements.) Th. Zürrer and H. Bovet. *Pro-Metal,* v. 2, June 1949, p. 389-395.

Properties and specific uses of Ni-Cr, Ni-Cr-Fe, Al-Cr-Fe, and Si-Cr-Fe alloys as heating elements. Constitution diagrams of Fe-Cr and Ni-Cr alloys.

3C-176. Magnetostriction of Fe-Pt Alloys. (In Russian.) N. S. Akulov, Z. I. Alizade, and K. P. Belov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 21, 1949, p. 815-818.

Investigated for alloys containing 54, 56, and 58% Pt. The influence of heat treatment.

3C-177. Über den hochduktilen Zustand von Legierungen auf Al-Zn-Basis. (The Highly Ductile State of Al-Zn-Base Alloys.) F. Sauerwald. *Archiv für Metallkunde,* v. 3, May 1949, p. 165-173.

The high ductility of Al-Zn alloys and methods of improving this property by suitable melting methods, heat treatments, forging, and alloying additions. Other mechanical and chemical properties of this type of alloy.

3C-178. Temperature Dependence of Susceptibility of Zinc, Cadmium, and Gamma-Brass. Jules A. Marcus. *Physical Review,* ser. 2, v. 76, Sept. 1, 1949, p. 621-623.

Temperature dependence (14-373° K.) of diamagnetic susceptibility of Zn and Cd single crystals and several polycrystalline gamma-brasses. 14 ref.

3C-179. Effect of Impurities on the Electrical Properties of Selenium. N. A. Penin and K. V. Astahov. *Engineering & Chemical Digest,* v. 1, July, 1949, p. 27-30. Translated from *Zhurnal Tekhnickeskoi Fiziki* (Journal of Technical Physics), v. 15, no. 2, 1945.

Experimental work.

3C-180. Specific Heat of Sodium Between 0° and 900° C., the Melting Point and Heat of Fusion. D. C. Ginnings, T. B. Douglas, and Anne F. Ball. *U. S. Atomic Energy Commission,* AECD-2639, July 6, 1949, 21 pages.

16 references.

3C-181. Law of Convergence to the Saturation Point in Polycrystalline Nickel. (In Russian.) N. S. Akulov and N. Z. Miryasov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 29-32.

Method of computation of coefficients in a formula proposed for the determination of differential sensitivity in polycrystalline ferromagnetics, free of residual stresses. Calculated coefficients for different values of the variables correspond closely to experimental data. 11 ref.

3C-182. Propriétés magnétiques des alliages cérium-magnésium. (Magnetic Properties of Cerium-Magnesium Alloys.) F. Mahn. *Revue de Métallurgie,* v. 46, June 1949, p. 365-369; discussion, p. 370.

Experimental results indicate that all CeMg alloys possess paramagnetic properties in accordance with Weiss's law. These properties are used to determine the equilibrium diagram of the binary system and the presence of certain intermetallic compounds. 10 ref.

3C-183. Über die elektrischen Eigenschaften des Thoriums. (Concerning the Electrical Properties of Thorium.) Dietrich Bender. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 257-260.

The effect of temperature on the electrical resistance of thorium was measured in order to determine whether it—like other elements in its group — has allotropic modifications. Data indicate no allotropic transformation up to 1100° C. 16 ref.

3C-184. Some New Data on the Properties of Wrought Titanium. F. B. Fuller. *Metal Progress,* v. 56, Sept. 1949, p. 348-350.

Various mechanical properties for annealed and cold rolled conditions.

3C-185. Some Properties of Uranium. A. R. Kaufmann. *Metal Progress,* v. 56, Sept. 1949, p. 386, 390, 392, 399.

See abstract from "The Science and Engineering of Nuclear Power. Vol. II", item 25A-65, 1949.

3C-186. Rectangular Hysteresis Loops of Co-Ni-Fe Alloys. R. A. Chegwidden. *Journal of Metals* (Technical Section) v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 570.

Shown graphically for two "Perminvars"—43% Ni, 34% Fe, and 23% Co; and 34% Ni, 34% Fe, 29% Co, and 3% Mo—both heat treated in a magnetic field.

3C-187. The Effect of Oxygen, Nitro-

gen, and Hydrogen on Iodide Refined Titanium. Robert I. Jaffee. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 646-654.

Effects of 0.25, 0.5, and 1.0 atomic % additions of each of the above gases on density, electrical resistivity, microstructure, mechanical properties, cold rolling characteristics, and work hardenability were determined. Apparatus and procedure for addition of the gases.

3C-188. Effets réversibles de l'adsorption des gaz sur la conductibilité électrique des couches métalliques très minces. (Reversible Effects of Gas Adsorption on the Electrical Conductivity of Very Thin Metallic Films.) Nicolas Mostovetch. *Comptes Rendus* (France), v. 228, May 30, 1949, p. 1702-1704.

A study of adsorption of air, N_2, O_2, H_2, and CO_2 on Mo, Pt, Rh, Ni, and Au. Resistance of deposits having a negative temperature coefficient decreases on adsorption of gas and increases reversibly on liberation of adsorbed gas. The reverse is true for deposits having a positive temperature coefficient of resistance. Results contribute to a better understanding of the structure of thin films and of the mechanism of their electrical conduction.

3C-189. Effets irréversibles des gaz sur la conductibilité électrique des couches métalliques très minces. (Irreversible Effects of Gas on the Electrical Conductivity of Very Thin Metallic Films.) Nicolas Mostovetch. *Comptes Rendus* (France), v. 228, June 13, 1949, p. 1850-1852.

Irreversible effects at pressures of 10^{-4} mm. Hg. Results for Mo, Au, Pt, Ta, and W in atmospheres of N_2, O_2, H_2, CO_2, and He. Data for Mo and Pt, over a wide range of temperatures and pressures, are shown graphically.

3C-190. Fabrication and Mechanical Properties of Ductile Zirconium. E. T. Hayes, E. D. Dilling, and A. H. Roberson. *American Society for Metals,* Preprint No. 32, 1949, 24 pages.

Properties of ductile Zr produced by magnesium reduction of zirconium chloride were determined on sheet produced by forging and rolling 10-lb. ingots in air at 650° C. or sheath-protected at 850° C. Optimum annealing conditions for 50% cold worked material. Ductile zirconium can be forged, swaged, rolled, drawn, and stamped, using conventional fabricating equipment. Hardness of Zr from −190 to 600° C., impact strength in the same temperature range, ultimate strength and elongation at −190° C., minimum bend radius for annealed and cold worked sheet, and resistivity of rod and wire. 19 ref.

3C-191. Titanium, Fact Versus Fancy. N. S. Spence. *Modern Metals,* v. 5, Sept. 1949, p. 15-17.

History, properties, economy and future.

3C-192. Some Properties of Superconductors Below 1° K. I. Titanium. J. G. Daunt and C. V. Heer. *Physical Review,* ser. 2, v. 76, Sept. 15, 1949, p. 715-717.

Magnetic measurements on Ti of 99.95% purity were carried out down to 0.3° K. It was found to be superconductive with a transition temperature of 0.53° K. Measurements of the magnetic threshold curve were made. 17 ref.

3C-193. Heat Flow in Metals Below 1° K and a New Method for Magnetic Cooling. C. V. Heer and J. G. Daunt. *Physical Review,* ser. 2, v. 76, Sept. 15, 1949, p. 854-855.

Measurements were made of the thermal conductivities of Sn and Ta both in the superconducting and normal states from 0.2 to 1° K. Experiments on thermal contact by heat flow through superconductors in this temperature range. Preliminary results.

3C-194. Measurements on the Negative Temperature Coefficient of Nickel Films. (In English.) A. Van Itterbeek, L. De Greve, and R. Celis. *Physica,* v. 15, July 1949, p. 433-436.

Influence of the gases A, He, Ne, H_2, and N_2 on variations of electrical conductivity with temperature.

3C-195. Thermal and Electrical Resistance of a Tungsten Single Crystal at Low Temperatures and in High Magnetic Fields. (In English.) J. De Nobel. *Physica,* v. 15, July 1949, p. 532-540.

Experiments made in order to determine whether the law of Wiedermann-Franz holds for the electrical and thermal conductivity due to electrons show that this law is not valid in stronger fields.

3C-196. Nuclear Magnetic Relaxation in Metallic Copper. (In English.) N. Bloembergen. *Physica,* v. 15, July 1949, p. 588-592.

The method of nuclear magnetic resonance absorption was used to measure relaxation time and line width of the resonance of the copper spins in metallic copper. 11 ref.

3C-197. Sur la variation du moment et du point de Curie du palladium hydrogéné. (Variation of Moment and of Curie Point of Hydrogenated Palladium.) Jules Wucher. *Comptes Rendus* (France), v. 229, July 18, 1949, p. 175-177.

Magnetic moment and Curie point

were studied for 0.1-mm. sheet and 0.5-mm. wire between −70 and 200° C.

3C-198. Conduction Processes in Thin Deposits of Antimony. Louis Harris and Lloyd H. Shaffer. *Physical Review*, v. 76, Oct. 1, 1949, p. 943-945.

Sublimed deposits having a resistivity 1.35 times massive resistivity were prepared. Assuming two conduction processes in Sb, the mean free paths for the processes in thin sublimed deposits were found to be 1725 Å and 666 Å. The trapping of electrons in the surface becomes important for thicknesses less than 1000 Å, which supports the concept of surface electronic states in metals. 18 ref.

3C-199. Current Densities in the Cathode Spots of Transient Arcs. J. M. Somerville and W. R. Blevin. *Physical Review*, v. 76, Oct. 1, 1949, p. 982.

Spots produced by high current arcs of short duration in air at atmospheric pressure on Al, Cu, Mg, Ni, Sn, and W cathodes. In arcs of short duration current densities of the order of 10^8 amp. per sq.cm. may prevail.

3C-200. Less Common Metals. H. H. Uhlig and D. B. Broughton. *Industrial and Engineering Chemistry*, v. 41, Oct. 1949, p. 2153-2154.

Reviews recent publications on Ti, Zr, Ta, Mo, Au, Pt, and Ag covering for the most part properties and applications. 67 ref.

3C-201. Specific Heat of Beryllium Between 0° and 900° C. D. C. Ginnings, T. B. Douglas, and Anne F. Ball. *U. S. Atomic Energy Commission*, AECD-2657, June 16, 1949, 12 pages.

11 references.

3C-202. Influence of Temperature on the Stress-Strain-Energy Relationship for Copper and Nickel-Copper Alloy. D. J. McAdam, Jr. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 727-740.

Results derived from tension tests of unnotched cylindrical specimens of monel and oxygen-free Cu at strain rates a little slower than those ordinarily used in tension tests and at temperatures of −188 to +165° C. 23 ref.

3C-203. Observations on the Failure of 80 Nickel, 20 Chromium Alloy at Excessive Temperatures. H. D. Holler. *Transactions of the Electrochemical Society*, v. 92, 1947, p. 91-97.

Previously abstracted from Preprint 92-7. See item 3-361, 1947.

3C-204. Penetration of Magnetic Field Into Superconductors. II. Measurements by the Casimir Method. E. Laurmann and D. Shoenberg. *Proceedings of the Royal Society*, ser. A, v. 198, Sept. 7, 1949, p. 560-581.

Changes with temperature of penetration of a magnetic field into superconducting Sn and Ag were studied by the above method in which a mutual inductance with a superconducting core is measured using low-frequency currents. The results were found to be very sensitive to surface conditions, but single crystals with smooth surfaces gave reproducible measurements. 18 ref.

3C-205. Surface Effect and Structure of Single Crystal Wires. E. N. da C. Andrade. *Nature*, v. 164, Sept. 24, 1949, p. 536-537.

A few months ago Randall and the author reported on the effect of certain electrolytes applied at the surface, on the flow of cadmium single crystals. Subsequent work with wires heated in vacuum, with consequent formation of a really clean surface, modifies considerably the effects previously reported. Cd sulfate and chloride have no effect on flow, but the nitrate produces the same hardening effect as before.

3C-206. Über eine thermische Anomalie der technischen Widerstandslegierung "Isabellin". (A Thermal Anomaly of the Commercial Resistance Alloy "Isabellin".) Otto Heusler. *Zeitschrift für Metallkunde*, v. 39, Nov. 1948, p. 326-333.

Above alloy (83% Cu, 12% Mn, 3% Al, and small amounts of Fe, Si, and P) was found to possess large temperature hysteresis, especially of electrical resistance and thermal expansion. G. Masing's proposed explanation of solidification of a thermally conditioned lattice distortion. 12 ref.

3C-207. Untersuchungen zur plastischen Deformation an Kupferdraht. (Research on Plastic Deformation of Copper Wire.) Doris Kuhlmann and Georg Masing. *Zeitschrift für Metallkunde*, v. 39, Dec. 1948, p. 361-375.

Reviews literature and describes experiments made to determine the isothermal torsional flow of different Cu wire coils or springs. Results and apparatus. 26 ref.

3C-208. Elimination by Lithium of Bismuth Embrittlement in Coppers. W. A. Baker and A. P. C. Hallowes. *Engineering*, v. 168, Oct. 7, 1949, p. 379-380. Condensed from "The Elimination by Lithium of Bismuth Embrittlement in Deoxidized Coppers and Copper Alloys".

Previously abstracted from *Journal of the Institute of Metals.* See item 3C-128, 1949.

3C-209. Metallography and Mechanical Properties of Internally Oxidized Alloys. *Research,* v. 2, Oct. 1949, p. 492-493.

Confirms and extends work of Meijering and Druyvesteyn, who showed that internal oxidation on annealing of certain dilute Ag and Cu-base alloys sometimes results in appreciable hardening. A Cu alloy containing 0.6% Al forms a single internally oxidized rim which is appreciably harder than the original alloy. By varying the annealing treatment it is possible to produce a rim which consists of two distinct zones.

3C-210. New Age-Hardening Alloy Meets Many Engineering Specifications. *Steel,* v. 125, Oct. 31, 1949, p. 46-49, 74.

Recommended techniques for forging, machining, and welding International Nickel's new high-temperature alloy designated as "Inconel X". Adaptability for such parts as gas-turbine rotor wheels, blades, and vanes, and for jet-engine and rocket-motor components.

3C-211. High Frequency Surface Resistivity of Tin in the Normal and Superconducting States. William M. Fairbank. *Physical Review,* ser. 2, v. 76, Oct. 15, 1949, p. 1106-1111.

Measurements were made at 9400 megacycles per sec. of the unloaded Q of a tin cavity from 74.9 down to 1.26° K. From these values and a knowledge of the geometry of the cavity, the high-frequency surface resistivity of white tin was calculated as a function of temperature in both the normal and the superconducting states. 18 ref.

3C-212. Nuclear Magnetic Resonance Shift in Metals. W. D. Knight. *Physical Review,* ser. 2, v. 76, Oct. 15, 1949, p. 1259-1260.

Observation of shift from expected values in Li, Na, Al, Cu, and Ga, in magnetic fields of 5-10,000 gausses, using an automatic search-type radiofrequency spectrometer.

3C-213. A Thermodynamic Study of Liquid Metallic Solutions. I. The System Lead-Gold. O. J. Kleppa. *Journal of the American Chemical Society,* v. 71, Oct. 1949, p. 3275-3280.

Chemical potentials and partial molar entropies of mixing for Pb in liquid Pb-Au mixtures were determined by the emf. method for compositions up to 79 atomic % Au. From these data, activities at 600° C., "entropy fractions", and relative partial and integral molar heats of mixing were calculated. Heat and free energies of formation for Au_2Pb(s) from liquid-Pb and undercooled liquid Au at about 400° were also calculated.

3C-214. Anisotropic Permanent Magnet Alloys. K. Hoselitz and M. McCaig. *Nature,* v. 164, Oct. 1, 1949, p. 581-582.

Results of measurements of some magnetic characteristics of "Alcomax" and compares them with those of Jellinghaus on another anisotropic permanent magnet alloy. Results confirm some of the conclusions of Jellinghaus and give information about the origin of the remarkable magnetic hardness of this type of alloy.

3C-215. The Basis of the Electron Theory of Metals, With Special Reference to the Transition Metals. N. F. Mott. *Proceedings of the Physical Society,* v. 62, sec. A, July 1, 1949, p. 416-422.

The collective electron and London-Heitler models are not to be regarded as different approximations to the same exact wave function for solids in which, according to the former model, there is a partially filled zone of energy levels. Thus shows why nickel oxide in the pure state is a nonconductor, although it contains an incomplete zone. Properties of Ni, Pd, and Pt in the light of the results. 21 ref.

3C-216. The Effect of Instantaneous Pre-Strain on the Character of Creep in Lead Polycrystals. A. J. Kennedy. *Proceedings of the Physical Society,* v. 62, sec. B, Aug. 1, 1949, p. 501-508.

Shows how extension vs. time curves of lead wires subjected to rapid strain just before the experiment may be expressed by the Andrade creep equation, using the same constants as those which satisfy the creep of the metal under the same constant stress, but with the t value associated with β replaced by $(t+t_0)$, where t_0 is a constant for a given experiment, its value increasing with increasing pre-strain.

3C-217. A Study of Magnetic Viscosity. R. Street and J. C. Woolley. *Proceedings of the Physical Society,* v. 62, sec. A, Sept. 1, 1949, p. 562-572.

A general analysis of magnetic viscosity based on activation-energy concepts. Considers particular case of application of the theory to phenomena occurring in materials in which bulk magnetization proceeds by rotational movements of vectors of single domains. Experiments were made using a magnetometer method, with specimens of Alnico maintained at various temperatures from −187 to 250° C. 10 ref.

3C-218. The Optical Constants of Thin Metallic Films. R. Weale. *Proceedings of the Physical Society,* v. 62, sec. B,

Sept. 1, 1949, p. 576-578.

The above are shown to depend on thickness of the films due to variation of electrical conductivity with thickness. Good and bad conductors both exhibit maxima in the curves relating absorption coefficient and film thickness, but these peaks are due to entirely different causes. Results for Pt, Pd, Au, Ag, and Cu. 10 ref.

3C-219. Propriétés d'aimant des poudres ferromagnétiques. Cas particulier de l'alliage MnBi. (Magnetic Properties of Ferromagnetic Powders. The Particular Case of MnBi Alloys.) Charles Guillaud. *Journal des recherches du Centre National de la Recherche Scientifique,* no. 9, 1949, p. 267-278.

Relationship of coercive field to size of powder particles, and influence of temperature and orientation on residual magnetism and coercive field.

3C-220. Britische Kupfersorten und -legierungen. (British Types of Copper and Copper Alloys.) H. Bröking. *Metall,* v. 3, Aug. 1949, p. 254-256.

Tabulated discussion on compositions and properties.

3C-221. Die heterogene Ausscheidung im System Gold-Nickel. (Heterogeneous Precipitation in the Gold-Nickel System.) Walther Gerlach. *Zeitschrift für Metallkunde,* v. 40, Aug. 1949, p. 281-289.

Magnetic and electrical properties as well as precipitation behavior of four supersaturated Au-Ni solid solutions (50, 23, 10, and 5% Ni) were quantitatively investigated by determining magnetic properties at different temperatures. Method of experimentation and results. 13 ref.

3C-222. Katalytische Untersuchungen an Legierungen. XII. Die Parawasserstoff-Umwandlung an Kupfer-Platin-Mischkristallen. (Catalytic Studies on Alloys. XII. The Parahydrogen Transformations in Copper-Platinum Solid Solutions.) Günther Rienäcker and Brigitte Sarry. *Zeitschrift für anorganische Chemie,* v. 257, Aug. 1948, p. 41-58.

Attempts to prove and explain the catalytic effect of metals and alloys —using Pt and its solid solutions with Cu as an example—by use of parahydrogen. Experimental production of the latter and method for determining the degree of transformation. Experimental apparatus. 14 ref.

3C-223. Thermoelectric Properties of Monovalent Metals. (In Russian.) F. G. Serova. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, May 1949, p. 460-468.

Thompson coefficient is calculated at high temperatures for Li and Na, taking into consideration the effect of entrainment of electrons by a stream of photons and the principle of partial dependence of length of free path of electrons on energy other than that of free electrons. 10 ref.

3C-224. Magnetic Anisotropy of Binary Nickel-Base Alloys. (In Russian.) I. M. Puzei. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 653-660.

The law of approach to saturation was investigated for polycrystals of Ni-Cu and Ni-Mo alloys. Relationships of anisotropic constant to temperature, concentration, and type of addition were determined. 15 ref.

3C-225. Influence of Tensile Stress on Spontaneous Magnetization of Nickel Close to the Curie Point. (In Russian.) K. P. Belov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 661-666.

Shows experimentally that elastic tensile stress influences the value of spontaneous magnetization of nickel and is especially significant in the region of the Curie point. This effect corresponds to the anomalous thermal expansion of nickel at the Curie Point. 13 ref.

3C-226. Influence of Surface-Active Substances on Small Deformations of Tin Monocrystals. (In Russian.) V. I. Likhtman and E. P. Zakoshchikova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 657-660.

Investigated for the range of stresses up to the yield point on tin wire 1 mm. in diam., and 2-3 cm. long. Comparative data for deformation in air and in surface-active media. Relaxation of elastic stresses in crystals in the presence of surface-active substances is more complete, and the value of remaining nonrelaxing elastic stresses is considerably less than in nonactive media.

3C-227. Concerning the Vapor Pressure of Some Pure Metals. (In Japanese.) Kideo Kaneko. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 24-27.

The vapor pressures of Cd, Mg, Se, Te, and Zn were measured by the boiling-point method devised by the author. From the results, empirical formulas for the relation between vapor pressure and temperature were determined.

3C-228. Research on Selenium and Its Alloys. III. Vapor Pressure of Selenium Alloys. (In Japanese.) Tomo-o Sato and Kideo Kaneko. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 27-31.

On the basis of data obtained from the refining of crude Se by distillation, results for binary alloys with Sn, Bi, Te, Hg, S, Cd, and Zn were obtained.

3C-229. Mechanisms of Failure of High Nickel-Alloy Turbojet Combustion Liners. John W. Weeton. *National Advisory Committee for Aeronautics,* Technical Note 1938, Oct. 1949, 45 pages.

Studies were made of "as-fabricated", heat treated, and mechanically finished liners, on liners after service operation, and on liners after accelerated engine runs. Large numbers of cracks formed at stress-relieving holes of louvers. Surface and subsurface scale was extensive. Resistance to cracking was increased by removing stress raisers from stress-relieving holes.

3C-230. Evaluation of the Stiffness Coefficients for Beryllium From Ultrasonic Measurements in Polycrystalline and Single Crystal Specimens. Louis Gold. *U. S. Atomic Energy Commission,* AECD 2644, July 21, 1949, 25 pages.

Experimental procedure. 11 ref.

3C-231. Some Properties of Superconductors Below 1° K. II. Aluminum and Zinc. J. G. Daunt and C. V. Heer. *Physical Review,* ser. 2, v. 76, Nov. 1, 1949, p. 1324-1328.

Magnetic measurements of the threshold curves of superconducting Al and Zn of very high purity were carried out down to 0.3° K. Calculations were made of the entropy differences between the normal and superconducting states and of the specific heats of the electron assemblies in both states. 26 ref.

3C-232. Surface Impedance of Normal and Superconductors at 24,000 Megacycles Per Second. E. Maxwell, P. M. Marcus, and J. C. Slater. *Physical Review,* ser. 2, v. 76, Nov. 1, 1949, p. 1332-1347.

Surface impedance of tin at 24,000 mc. per sec. was investigated from 2 to 300° K., including both the superconducting and normal states, by means of a resonant-cavity technique. Experimental techniques; data for the normal state discussed in terms of the theory of anomalous skin effect given by Reuter and Sondheimer. 13 ref.

3C-233. Ueber die Entfestigung von Legierungen. (Concerning the Stress-Relief of Alloys.) E. Brandenberger. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Sept. 1949, p. 258-259.

Observations that filing chips undergo spontaneous stress relief even at room temperature led to experimentation on the differential behavior of crystal aggregates and pulverized materials with respect to stress-relief annealing at different temperatures. Experiments were made with three high-gold alloys, with pure Ni, and with three high-Ni alloys.

3C-234. The Relationship Between Energy Levels of the Valence Electrons of Cu and Its Photoelectric Effects and Light Absorption of a Thin Film. (In Japanese.) Mituru Sato and Tosiro Suzoka. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 9-12.

Relative positions of energy levels determined from X-ray spectra were reported in a previous paper. These results are compared with those based on photoelectric effects and light absorption. Certain fundamental conclusions regarding the mechanism of electrical conduction and photoelectric emission are summarized in English.

3C-235. Zur Temperaturabhängigkeit der Magnetisierung von Nickel. (The Temperature Dependence of the Magnetization of Nickel.) W. Jellinghaus and H. Schlechtweg. *Annalen der Physik,* ser. 6, v. 2, Apr. 1, 1948, p. 161-177.

A study made to test the validity of Weiss's law. Langevin's theory is explained and numerous mathematical equations develop a differentiation of the equilibrium equation and a way of determining the magnetization constant, Weiss's factor, and effect of magnetization constant and temperature on field strength.

3C-236. Über einen neuen Nachweis von spontaner Magnetisierung oberhalb der Curietemperatur. (A New Proof of Spontaneous Magnetization Above the Curie Temperature.) Friedrich Fraunberger. *Annalen der Physik,* ser. 6, v. 2, Apr. 1, 1948, p. 178-182.

Observations of high-frequency permeability of nickel showed that it, and also spontaneous magnetization, disappears only at 50-100° C. above the Curie point. Methods of measurement and results.

3C-237. Die Eisen-Platin-Invare und ihre Ausdehnungs-Anomalien. (The Iron-Platinum Invars and Their Expansion Anomalies.) A. Kussmann, M. Auwärter, and G. Grfn v. Rittberg. *Annalen der Physik,* ser. 6, v. 4, Nov.

24, 1948, p. 174-182.

Pt-Fe alloys between 54 and 65 weight % show stronger Invar effects than nickel steels, and negative thermal coefficients of expansion are the largest observed so far. Properties can be controlled by heat treating, their change being related to the formation or solution and ordered dispersion of Fe_3Pt atoms. Observed phenomena are explained by the extremely high magnetostriction of the alloys up to 300° C.

3C-238. Zur magnetischen Suszeptibilitat von in flüssigem Ammoniak gelösten Metallen. (Concerning the Magnetic Susceptibility of Metals Dissolved in Liquid Ammonia.) Erich Huster. *Annalen der Physik,* ser. 6, v. 4, Nov. 24, 1948, p. 183-190.

Determination for calcium. Results are compared with those obtained by other authors for Na, Cs, K, Ca, and Ba. Apparatus and technique; results.

3C-239. A High Strength-High Conductivity Copper-Silver Alloy Wire. W. Hodge, R. I. Jaffee, J. G. Dunleavy, and H. R. Ogden. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 15-31.

Previously abstracted from *Metals Technology.* See item 3c-50, 1948.

3C-240. A Copper-Base Alloy Containing Iron as a High-Strength High-Conductivity Wire Material. W. Hodge, R. I. Jaffee, J. G. Dunleavy, and H. R. Ogden. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 32-41.

Previously abstracted from *Metals Technology.* See item 3c-72, 1948.

3C-241. Effect of Grain Size on Tensile Strength, Elongation, and Endurance Limit of Deep Drawing Brass. H. L. Walker and W. J. Craig. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 42-51.

Previously abstracted from *Metals Technology.* See item 3c-88, 1948.

3C-242. Electrical Properties of the Intermetallic Compounds Mg_2Sn and Mg_2Pb. W. D. Robertson and H. H. Uhlig. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 345-355.

Previously abstracted from *Metals Technology.* See item 3c-108, 1948.

3C-243. The Low Temperature Properties of Tin and Tin-Lead Alloys. H. S. Kalish and F. J. Dunkerley. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 637-656.

Previously abstracted from *Metals Technology.* See item 3c-86, 1948.

3C-244. Thermal and Electrical Properties of Ductile Titanium. E. S. Greiner and W. C. Ellis. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 657-665.

Previously abstracted from *Metals Technology.* See item 3c-87, 1948.

3C-245. (Book) Blagorodnye Metally. Svoistva, Primenenie, Zameniteli. (Precious Metals. Properties, Applications, Substitutes.) A. V. Boitsov, G. F. Boitsova, and N. A. Avdonina. 387 pages. 1946. State Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

A comprehensive handbook on the physical and chemical properties of precious metals and their alloys and their application in industry and research. The first part covers gold and its alloys; the second, silver and its alloys; and the third the platinum group (platinum, ruthenium, rhodium, palladium, osmium, and iridium). 116 ref.

3C-246. Creep of Titanium at Room Temperature. Heinrich Adenstedt. *Metal Progress,* v. 56, Nov. 1949, p. 658-660.

Experimental data compared with those of other investigators.

3C-247. Magnetic Properties of Nickel-Cobalt and Related Alloys. E. P. Wohlfarth. *Philosophical Magazine,* ser. 7, v. 40, Nov. 1949, p. 1095-1111.

Discussed on the basis of the collective electron theoretical treatment of ferro-magnetism. Assumptions are briefly discussed in relation to the present work. Experimental results for Ni-Co and Ni-Fe alloys include variation of saturation moment and Curie temperature with concentration, and of susceptibility and spontaneous magnetization with temperature. 24 ref.

3C-248. Festigkeitseigneschaften verschiedener Drukguss-Werkstoffe. (Strength Properties of Different Pressure-Cast Materials.) Erich Meyer-Rässler. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 355-358.

Production and testing of standard test bars of Al, Mg, and Zn alloys and brass.

3C-249. Leghe rame-berillio-manganese ricche in rame. (Copper-Rich Copper-Beryllium-Manganese Alloys.) Venturello and Mocarksi. *La Metallurgia Italiana,* v. 41, July-Aug. 1949, p. 181-184.

Many with increasing contents of Be and Mn up to about 2.5% and 8% respectively were examined. Shows that Mn accelerates separation of

CuBe, thus diminishing the time necessary for aging treatment and improving the mechanical properties of the alloys. The best results were obtained with alloys containing 1.8-2.5% Be and 3-5% Mn.

3C-250. Influence of Magnetic Field on the Electrical Resistance of a Manganese-Antimony Ferromagnetic Alloy. (In Russian.) I. G. Fakidov and N. P. Grazhdankina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 847-849.

The Thompson-Goldhammer effect was investigated for a Mn-Sb alloy containing 54 and 50 atomic % Sb. Method of investigation, including preparation of test specimens. 10 ref.

3C-251. Influence of the Size of Metallic Monocrystals on the Shape of the Elongation Diagram and on the Strength Decrease Caused by the "Adsorption Effect". (In Russian.) V. I. Likhtman and E. K. Venstrem. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 881-883.

Effect of adsorption of surface-active agents investigated for monocrystalline tin wire from 0.4 to 2 mm. in diam.

3C-252. Changes in Electrical Resistance of "Superstructural" Alloys in a Longitudinal Magnetic Field. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1071-1074.

Results of a study of Thomson's galvanomagnetic effect and magnetic properties of a Ni-Mn alloy and their variation with time and temperature of annealing.

3C-253. Liquidus Temperatures and Liquid Densities of Zinc-Aluminum Alloys. I. S. Solet and Hillary W. St.Clair. *U. S. Bureau of Mines,* Report of Investigations 4553, Nov. 1949, 7 pages.

Methods used in measuring the above. 12 ref.

3C-254. On the Propagation of Large Barkhausen Discontinuities in Ni-Fe Alloys. L. J. Dijkstra and J. L. Snoek. *Philips Research Reports,* v. 4, Oct. 1949, p. 334-356.

Propagation of the Bloch boundary between two macro-domains under the influence of an external magnetic field was investigated for Ni-Fe wires of 60-40 and 50-50 compositions subjected to tensile stress. Reviews various factors determining the shape of the boundary and its rate of propagation. Results lead to the concept that the movement of the boundary is impeded by two causes of different origin, the eddy-current effect and a spin-relaxation effect.

3C-255. The Thermal Conductivity of Lead and Tin in the Superconducting and in the Normal State. (In English.) A. Rademakers. *Physica,* v. 15, Oct. 1949, p. 849-859.

Pure samples of lead and tin were examined at temperatures between 1.4 and 4° K. Results are compared with those predicted by Heisenberg's theory.

3C-256. Sur l'oxydation du cerium et du lanthane. (Oxidation of Cerium and Lanthanum.) Jean Loriers. *Comptes Rendus* (France), v. 229, Sept. 12, 1949, p. 547-549.

The rate and course of oxidation were studied. Cerium is pyrophoric in character, but lanthanum is not, evidently because of formation of a protective oxide film.

3C-257. Champ coercitif et granulométrie du nickel Raney. (Coercive Force and Grain Size of Raney Nickel.) Louis Weil. *Comptes Rendus* (France), v. 229, Sept. 19, 1949, p. 584-585.

The coercive force of very fine ferromagnetic powder and of Ni reduced from oxalate or formate were previously found to decrease on increase of their densities by heating or compression. On the contrary, the coercive force of Raney nickel increased greatly, even up to three times, on application of such treatments. A theoretical explanation of the results.

3C-258. Field Dependence of Diamagnetism at Low Temperatures. (In English.) M. D. Shoenberg. *Bulletin de la Société Chimique de France,* July-Aug. 1949, p. D363-D364; discussion, p. D364-D365.

Compares results obtained by the author and other investigators for Bi, Zn, and Ga.

3C-259. Etude par la dureté de l'aptitude aux déformations plastiques et à l'écrouissage du zinc laminé à froid. (Study, by Means of Hardness Determination, of the Tendency Toward Plastic Deformation and Strain Hardening of Cold-Worked Zinc.) P. Bastien and A. Popoff, *Revue de Métallurgie,* v. 46, Sept. 1949, p. 583-593.

The empirical indexes of Meyer and Hargreaves, characterizing, respectively, the tendency toward strain hardening and plastic deformation of polycrystalline cold worked Zn, were determined under different conditions. Relationships between different factors involved.

3C-260. Frottement interne des alliages

métalliques. (Internal Friction in Metallic Alloys.) Robert Cabarat, Léon Guillet, and René Le Roux. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 622-626.

Effect of physicochemical constitution of a full range of Cu-Zn and Cu-Sn alloys on their modulus of elasticity and internal friction.

3C-261. Influence of Temperature on Mechanical Properties of Manganese. (In Russian.) E. M. Savitskii and V. F. Terekhova. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 87-90.

Upon heating of Mn, certain modifications having a simpler structure, characterized by a smaller number of atoms in the unit cell, begin to predominate. This results in increased plasticity.

3C-262. Influence of Temperature on Surface Photo-Effect of Semiconductors. (In Russian.) A. N. Arsen'eva-Geil. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 245-247.

Determined for In, Se and Te. Comparison with a similar curve for silver.

3C-263. Level of Electrical Fluctuations in Certain Metals After Annealing. (In Russian.) E. Ya. Pumper. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 277-279.

Experimental investigation showed an increase in the above (the Boltzmann constant) for certain metals, after annealing, up to a maximum in 7-8 days, followed by a gradual decrease to less than the initial value. A tentative explanation and use as the basis for a new method to study various processes in metals. Tabulated data for nichrome and a curve for tungsten.

3C-264. Electrocapillary Effect of a Decrease in Hardness of Metal. (In Russian.) E. K. Venstrem and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 329-332.

The previously established relationship of hardness of metals to polarization was investigated for graphite, Tl, Zn, Pb, and Te. Curves of surface tension vs. hardness for these materials in several solutions.

3C-265. Cemented Titanium Carbide. John C. Redmond. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 987-993.

Has transverse rupture strengths up to 175,000 psi. or 75% greater than previously reported. Either Co, Ni, or Fe may be used as an auxiliary metal. Addition of minor percentages of Ta carbide or of Cb and Ta carbide reduced the oxidation rate to very small values at temperatures up to 2200° F. 13 ref.

3C-266. Intergranular Parting of Brass During Anneals. F. H. Wilson and E. W. Palmer. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 995-1003.

Details of extensive investigation of defect which is occasionally encountered in commercial fabrication of 70-30 brass. Shows that it has a structural appearance which can be duplicated by holding tensile specimens at a constant stress at elevated temperatures. Importance of grain size was demonstrated. Conclusions based on experimental work are in agreement with practical solutions to commercial problems. Recommendations for minimizing occurrence of the defect. 17 ref.

3C-267. The Low Temperature Properties of Tin-Antimony and Tin-Cadmium Alloys. F. J. Dunkerley, H. B. Hunter, and F. G. Stone. *Journal of Metals* (Transactions Sections), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 1005-1016.

Tensile properties of 13 binary alloys containing 0.1-60% Cd and 0.1-10.43% Sb at six temperatures from −196 to +23° C. are presented and their variations rationalized in terms of microstructure. 12 ref.

3C-268. Hardness of Nickel Compacts. S. R. Williams. *Metal Progress,* v. 56, Dec. 1949, p. 811-813.

Results of a study of sintered nickel plates used in batteries. The ordinary hardness tester was found to be unsuitable, since the ratio of load to indentation was too small. A special tester was developed using the Ludwik cone indenter and a controlled load. Distinction between macro and microhardness testers, and use of a load criterion.

3C-269. Effects of Melting Atmosphere, Time at Temperature and Degasification on Properties of Valve Bronze. W. H. Baer and B. M. Loring. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 257-261; discussion, p. 261-262.

Previously abstracted from preprint. See item 2C-20, 1949.

3C-270. Melt Quality and Fracture Characteristics of 85-5-5 Brass. J. F. Ewing, C. Upthegrove, and F. B. Rote. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 433-447; discussion, p. 447-449.

Data obtained while developing a fracture-test procedure. Quality was evaluated on the basis of tensile strength, elongation, and density of test bars.

3C-271. Effect of Composition on Properties and Structure of Cast Monel. J. T. Eash and T. E. Kihlgren. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 535-544; discussion, p. 544-545.

Previously abstracted from preprint. See item 3C-68, 1949.

3C-272. Investigation of Constant of Anisotropy of Energy of Ternary Alloys of the System Ni-Cu-Mo. (In Russian.) N. S. Skulov, O. I. Blokhina, K. M. Bol'shova. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Aug. 1949, p. 865-870.

The influence of each element was investigated for multicomponent systems of Ni with nonferromagnetic elements. On the basis of previous investigations of binary alloys of Ni-Cu and Ni-Mo, the question of how the constant of anisotropy decreases in Ni-Cu-Mo alloys with increase of amount of Cu and Mo was solved. As a result, it is assumed that the above relationship has a universal character.

3C-273. Beitrag zu den magnetischen Eigenschaften und der Verwendbarkeit pulvermetallurgisch hergestellter Dauermagnete. (Magnetic Properties and Utility of Permanent Magnets Made by Powder Metallurgy.) Hermann Fahlenbrach. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 301-304.

Theoretical considerations of the effects of various factors on the magnetic properties of AlNi and AlNiCo sintered alloys, and a comparison with measured magnetic properties. AlNiCo magnets with energy values of $3.0\text{-}3.8 \times 10^6$ gauss times oersted and thicknesses of 0.1-0.2 mm. can be made by the sintering process. 17 ref.

3C-274. Relation entre les moments et les points de Curie d'alliages isoélectroniques du groupe fer-cobalt-nickel. (Relation Between Moments and Curie Points of "Isoelectronic" Alloys of the Fe-Co-Ni Group.) Pierre Taglang. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 704-706.

A series of alloys having a constant number of electrons is designated as "isoelectronic" alloys. Method and apparatus for preparation and investigation of the alloys.

3C-275. Mesure de l'effet gyromagnétique d'alliages ferromagnétiques isoélectroniques. (Determination of Gyromagnetic Effect in "Isoelectronic" Ferromagnetic Alloys.) André J. P. Meyer. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 707-708.

Ferromagnetic alloys of the Fe-Co-Ni group, differing in chemical composition, but possessing the same average number of electrons and crystallizing in same lattice, are distinguished by different atomic moments and Curie points. Attempts to prove R. Forrer's hypothesis by measurements of gyromagnetic effect using the Einstein-de Haas resonance method.

3C-276. Le champ coercitif des poudres ferromagnétiques. (Coercive Force of Ferromagnetic Powders.) Charles Guillaud. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 818-819.

Investigated for Mn_2Sb in solid and powdered form. Observed variations are explained theoretically.

3D—Light Metals

3D-1. Titanium—An Appraisal. Neville S. Spence. *Light Metals,* v. 11, Dec. 1948, p. 645-647.

Commercial development of the above "near" light metal. Suggests that it may develop into an active competitor, in specialized engineering fields, to aluminum and magnesium.

3D-2. Physical Properties of Titanium Alloys. *Iron Age,* v. 162, Dec. 30, 1948, p. 41-43.

Data reported at titanium symposium held recently in Washington, D. C., under the sponsorship of the Office of Naval Research. "Physical and Mechanical Properties of Commercially Pure Titanium", C. I. Bradford; "Properties of Iodide Type Titanium", F. B. Litton; "Some Preliminary Data on Alloys of Titanium", E. I. Larson, E. F. Swazy, L. S. Busch, and R. H. Freyer; "Titanium Base Alloys", H. C. Cross.

3D-3. Plastic Deformation Waves in Aluminum. Andrew W. McReynolds. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 32-45.

Plastic deformation of 2S aluminum and Al-Cu alloys was found to proceed according to a stair-step stress-strain curve. The same effect was observed in 70-30 alpha brass. The discontinuities were found to result from propagation of waves of plastic deformation along all or part of the specimen length.

The effect was found to depend on presence of an alloying element. It does not occur in 99.99% Al. 24 ref.

3D-4. Sur l'influence de faibles traces d'impuretés et de l'écrouissage sur la variation des propriétés mécaniques de l'aluminium au cours de sa recristallisation. (Influence of Traces of Impurities and of Cold Working on the Variation of the Mechanical Properties of Aluminum During its Recrystallization.) Henri Chossat, Michel Mouflard, Paul Lacombe, and Georges Chaudron. *Comptes Rendus* (France), v. 227, Aug. 18, 1948, p. 432-433.

The above was investigated for 99.99 and 99.998% Al. Changes in physical properties depending on recrystallization temperatures are indicated.

3D-5. Uber den Einfluss von Quecksilber auf die Festigkeitseigenschaften einer Magnesium-Mangan-Legierung. (Concerning the Effect of Mercury on the Strength of a Magnesium-Manganese Alloy.) Walter Bulian. *Metallforschung*, v. 2, May, 1947, p. 158-160.

Experiments with Mg alloys containing 1.8% Mn and 0.2-1.8% Hg showed that Hg does not appreciably affect tensile strengths but slightly improves resistance to corrosion. Production of the alloys is described and micrographs show the effect of Hg on alloy structures.

3D-6. The Magnetic Moment of Aluminum^{27}. John R. Zimmerman and Dudley Williams. *Physical Review*, ser. 2, v. 75, Jan. 1, 1949, p. 198-199.

Preliminary results for this aluminum isotope.

3D-7. Advances in Magnesium Technology. *Light Metals,* v. 12, Jan. 1949, p. 24-28.

Recent developments indicate that future alloys are likely to contain more or less zirconium and cerium, together with trace quantities of beryllium.

3D-8. Age Hardening of Light Alloys. A. Guinier. *Research,* v. 2, Jan. 1949, p. 6-11.

Properties of light metals and alloys, physical investigations, solubility data, age-hardening theories, general features.

3D-9. High-Temperature Tensile Properties of Cast Aluminium-Silicon Alloys and Their Constitutional Significance. W. I. Pumphrey and P. H. Jennings. *Journal of the Institute of Metals*, v. 75, Dec. 1948, p. 203-233.

The above were determined during cooling from the liquid state and after rapid reheating of chill-cast alloys. Strength-temperature curves relating to both conditions were obtained for 10 alloys containing 0-12% Si. Effects of various factors on the form of the strength-temperature curve. 12 ref.

3D-10. A Consideration of the Nature of Brittleness at Temperatures Above the Solidus in Castings and Welds in Aluminium Alloys. W. I. Pumphrey and P. H. Jennings. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 235-256.

A critical examination of the cause of cracking; it is concluded that it occurs in the brittle temperature range. Factors which affect the extent of the latter; the relationship between the cracking tendency and results of a test designed to observe such a tendency. Results of a mathematical study of conditions responsible for cracking in a butt weld between two parallel and restrained sheets of an aluminum alloy with wide freezing range and a small proportion of eutectic.

3D-11. A Consideration of the Nature of Brittleness at Temperatures Below the Solidus in Castings and Welds in Aluminium Alloys. W. I. Pumphrey and D. C. Moore. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 257-267.

Occurrence of such cracking depends on ductility of the metal, on conditions of stress to which a cooling metal is subjected at subsolidus temperatures, and on the amount of cracking which occurs at temperatures above the solidus during cooling of the metal from the liquid state. The likelihood of subsolidus cracking in industrial conditions of casting and welding, and possible methods for its avoidance. 10 ref.

3D-12. Linearer Ausdehnungskoeffizient und elektrischer Widerstand von Aluminiumgusslegierungen mit Kupfer und Silizium. (Linear Expansion Coefficient and Electrical Resistance of Aluminum Cast Alloys Containing Copper and Silicon.) Franz Bollenrath and Viktor Hauk. *Zeitschrift fur Metallkunde,* v. 39, Apr. 1948, p. 106-108.

Experimental data and a constitution diagram. 15 ref.

3D-13. Röntgenographische Spannungsmessungen an Zugstäben aus Reinaluminium und aus einer Aluminium-Kupfer-Magnesium-Legierung bei plastischer Verformung. (X-Ray Stress Determination on Plastically Deformed Tensile Bars of Pure Aluminum and of an Aluminum-Copper-Magnesium Alloy.) Viktor Hauk. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 108-110.

A brief factual description of the experiments and evaluation of the results.

3D-14. Contribution a l'étude du pouvoir thermoélectrique des métaux. (Contribution to the Study of the Thermoelectric Capacity of Metals.) C. Crussard and F. Aubertin. *Revue de Métallurgie*, v. 45, Oct. 1948, p. 402-410; discussion, p. 410.

The influence of structural changes induced by heat treatment, deformation, recrystallization, precipitation, etc., were investigated using Al-Cu, Al-Cu-Mg, and Al-Mg alloys. 13 ref.

3D-15. Magnesium-Lithium Base Alloys—Preparation, Fabrication, and General Characteristics. J. H. Jackson, P. D. Frost, A. C. Loonam, L. W. Eastwood, and C. H. Lorig. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 149-168.

Experimental program conducted at Battelle Memorial Institute for Mathieson Chemical Corp. to determine whether addition of Li to Mg in sufficient quantities to change the crystal structure from hexagonal to body-centered cubic would result in improved cold-working characteristics and less anisotropy. Melting technique, fabricating practice, density measurements, mechanical properties, workhardening and stability characteristics, corrosion resistance, metallographic structure, information on effects of other elements.

3D-16. Hot Tearing of Aluminum Castings. *Iron Age*, v. 163, Feb. 24, 1949, p. 100. Based on article in *Metallurgia*, Jan. 1949 (taken from *Bull. Acad. Sci.*, USSR).

Results of a study of Al-Cu alloys containing 0 to 12% Cu and Al-Si alloys containing 0 to 4% Si. Specially developed quantitative test for resistance to shrinkage stresses, in which a mold having a movable end with a variable weight attached was used.

3D-17. New Alloy Group. *Light Metals,* v. 12, Feb. 1949, p. 106-108.

New group of proprietary British Al-Mg alloys known as the "Vmarilites". Mechanical properties in comparison with other Al alloys, cast irons, and Cu alloys. Applications. Compositions are not given.

3D-18. Tensile, Creep and Fatigue Properties at Elevated Temperatures of Some Magnesium-Base Alloys. John C. McDonald. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 18 pages.

Tests on castings and forgings to be used in engines.

3D-19. Mechanical Properties of Alloys of the Al-Mg System. (In Russian.) E. M. Savitskii and M. A. Tylkina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 1, 1948, p. 49-51.

Properties for those compositions close to 50-50. Methods of preparation and testing of very brittle intermetallic phases present in this region. Compositions and mechanical properties.

3D-20. Hall Effect in Liquid Rubidium. (In Russian.) I. G. Fakidov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 123-125.

Investigation indicates the presence of electromagnetic and thermomagnetic effects in the liquid metal similar to those in the solid state.

3D-21. Tension Properties of Aluminum Alloys in the Presence of Stress-Raisers. I. Effects of Triaxial Stress States on the Fracturing Characteristics of 24S-T Aluminum Alloy. A. W. Dana, E. L. Aul, and G. Sachs. *National Advisory Committee for Aeronautics,* Technical Note No. 1830, Mar. 1949, 55 pages.

Effects of circumferential notches on tensile-test bars. Two variations in notch contour, namely, notch radius and depth, were studied; also two different surface conditions.

3D-22. Aluminum Alloy Bearings—Metallurgy, Design and Service Characteristics. H. Y. Hunsicker. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 82-118; discussion, p. 136-137.

Commercial alloys; performance characteristics; and fabrication procedures. 58 ref.

3D-23. Note on the Effect of Impurities and Cold Work on the Thermoelectric Power of Aluminium. J. K. Galt. *Philosophical Magazine,* ser. 7, v. 40, Mar. 1949, p. 309-314.

Recent observations of Crussard are discussed theoretically. Dissolved impurities produce a change in the thermo-electric power of pure Al which can be understood in terms of electronic band structure. When impure Al is cold worked, variation of thermo-electric power with time and temperature is changed. An explanation in terms of the theory of dislocations is proposed.

3D-24. Change of Electrical Resistance

of Alloys During Aging. Z. Matyas. *Philosophical Magazine,* ser. 7, v. 40, Mar. 1949, p. 324-337.

Mechanism by which conduction electrons in pure Al are scattered when an external field is applied. Application of these results to dilute solid solutions of Al permits prediction of change of resistivity during aging. Two alloys are considered: duralumin and an Al-Ag alloy in two different stages of aging.

3D-25. Tension Properties of Aluminum Alloys in the Presence of Stress-Raisers. II. Comparison of Notch Strength Properties of 24S-T, 75S-T, and 24S-T86 Aluminum Alloys. E. L. Aul, A. W. Dana, and G. Sachs. *National Advisory Committee for Aeronautics,* Technical Note No. 1831, Mar. 1949, 62 pages.

142 references.

3D-26. Elevated-Temperature Compressive Stress-Strain Data for 24S-T3 Aluminum-Alloy Sheet and Comparisons With Extruded 75S-T6 Aluminum Alloy. William M. Roberts and George J. Heimerl. *National Advisory Committee for Aeronautics,* Technical Note No. 1837, Mar. 1949, 11 pages.

Results obtained at stabilized elevated temperatures up to 700° F., exposure times of ½ to 2 hr., and strain rates of 0.002-0.006 per min.

3D-27. Typical Characteristics of Magnesium Alloys. *Welding Engineer*, v. 34, Apr. 1949, p. 65.

A tabulation.

3D-28. Commercial Aluminum Casting Alloys. W. E. Sicha. *American Society for Metals,* "Physical Metallurgy of Aluminum Alloys," 1949, p. 129-166.

Properties and applications of the various alloys and the finished castings. Amenability to heat treatment and corrosion resistance. Compositions, physical and mechanical properties, and recommended heat treatments.

3D-29. Sur l'influence de la déformation plastique sur le module d'élasticité. (Influence of Plastic Deformation on Modulus of Elasticity.) Pierre Laurent and Michel Eudier. *Comptes Rendus,* v. 228, Jan. 17, 1949, p. 225-226.

The fluctuation of modulus of elasticity during creep testing of an Al-Cu alloy containing 9.7% Cu at room temperature. It was found that the final increase of the modulus of elasticity (after 54-64 hr.) is caused by modification of the structure of the material; and that the initial decrease is caused by plastic deformation.

3D-30. Experimental Determinations of Stopping Powers Using Alpha-Particles of 15 to 37 Mev. E. L. Kelly. *Physical Review,* ser. 2, v. 75, Apr. 1, 1949, p. 1006-1007.

The integrated stopping power relative to Al was measured for Cu, Ag, Ta, Bi, and Th using alpha-particles of approximately 15-28 Mev. and 28-37 Mev. energies.

3D-31. Recherches récentes sur les alliages Al-Zn-Mg-Cu. (Recent Research on Al-Zn-Mg-Cu Alloys.) A. Saulnier and G. Cabane. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 13-23.

Newly developed French Al alloys having a very high elastic limit (up to 65 kg. per sq. mm.) and fatigue strength (16-18 kg. per sq mm.). Development of the 7.5% Zn, 2.5% Mg, and 7.5% Zn, 2.5% Mg, 1.5% Cu alloys. Chemical and physical properties including optimum conditions of heat treatment. 12 ref.

3D-32. Advances in Magnesium Technology. (Concluded.) *Canadian Metals and Metallurgical Industries,* v. 12, Apr. 1949, p. 30.

Properties of some new alloys.

3D-33. Beitrag zum Problem der Kaltaushärtung von Aluminiumlegierungen auf Grund dilatometrischer Messungen. (Research on the Cold Aging of Aluminum Alloys Utilizing Dilatometric Measurements.) Friedrich-Carl Althof. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 54-66.

Measurements made with Marten's reflector apparatus show that cold-aging alloys change in length by 0.003-0.02%. No correlation could be established between length changes and changes in strength. Dilatometric results are compared with those of X-ray analysis and critically evaluated. 28 ref.

3D-34. Combustion de l'aluminium dans l'oxygene. (Combustion of Aluminum in Oxygen.) Jean Cueilleron and Hubert Scartazzini. *Comptes Rendus,* v. 228, Feb. 7, 1949, p. 489-490.

Results of a spectroscopic study of the flame produced by combustion of aluminum powder in oxygen.

3D-35. Biaxial Fatigue Strength of 24S-T Aluminum Alloy. Joseph Marin and William Sheldon. *National Advisory Committee for Aeronautics,* Technical Note No. 1889, May 1949, 41 pages.

The influence of various ratios of maximum values of principal stresses upon fatigue strength. Fluctuating biaxial tensile stresses were produced by applying a pulsating internal pressure and an axial tensile load to a thin-walled tubular specimen. Maximum and minimum values of the principal

stresses were kept in phase. To apply the dynamic loads, a new type of testing machine was designed and constructed. S-N diagrams for four principal stress ratios were obtained for defining fatigue strength up to 5 x 10^6 cycles.

3D-36. Tensile, Creep and Fatigue Properties at Elevated Temperatures of Some Magnesium-Base Alloys. John C. McDonald. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 737-753; discussion, p. 754.

Previously abstracted from advance reprint. See item 3D-18, 1949.

3D-37. New Aluminum Extruding Alloy Used for Tubing and Architectural Applications. *Materials & Methods,* v. 29, May 1949, p. 59.

Composition, properties, and applications of 63S alloy.

3D-38. New General-Purpose Aluminum Sheet Alloy. *Modern Metals,* v. 5, May 1949, p. 17-19.

New commercial Al-Mg alloy, 150S, and its properties and typical applications. It is designed to fill a gap between 3S and 52S.

3D-39. Presseffekt und Biegedauerfestigkeit einiger Aluminium-Kupfer-Magnesium-Knetlegierungen mit verschiedenen Mangangehalten. (Effect of Forging on the Fatigue Bending Strength of Several Aluminum-Copper-Magnesium Alloys With Varying Manganese Contents.) Walter Bungardt and Eugen Osswald. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 185-189.

Static and dynamic tests were made on round bars made either by forging only or by forging followed by cold drawing for seven Al-Cu-Mg alloys containing 0-1.6% Mn, 4-4.5% Mg, 1% Cu, 0.5% Si, and 0.4% Fe. 17 ref.

3D-40. Die Dauerstandfestigkeit der Magnesiumlegierungen. (The Fatigue Strength of Magnesium Alloys.) Hugo Vosskuhler. *Zeitschrift fur Metallkunde,* v. 39, July 1948, p. 193-204.

A fatigue-strength testing machine and results of its use on a number of commercial Mg alloys under constant load and temperature.

3D-41. Ueber den Einfluss von Zink auf einige Eigenschaften technischer Aluminium - Kupfer - Magnesium - Knetlegierungen. (The Effect of Zinc on Several Properties of Commercial Aluminum-Copper-Magnesium Malleable Alloys.) Walter Bungardt and Hanns Grober. *Metall,* July 1948, p. 217-220.

Effects on hardness, static and dynamic strength, density, and sensitivity to high temperatures. Their ability to be bent, drawn, and worked; their tendency to form coarse granular structures; and their behavior with respect to corrosive agents. The testing procedure.

3D-42. Versuche zur Entwicklung einer hochfesten Aluminium-Magnesium-Zink-Knetlegierung. (Experiment Made to Develop a High-Test Aluminum-Magnesium-Zinc Malleable Alloy.) G. H. Vosskuhler. *Metall,* Aug. 1948, p. 251-258; Sept. 1948, p. 288-291.

A comprehensive report showing the effect of various additions (such as Cu, Cr, Ti, Mn, Fe, Zr, and Si) on the physical properties of these alloys. 13 ref.

3D-43. Creep and Stress-Rupture Investigations on Some Aluminum Alloy Sheet Metals. J. E. Dorn and T. E. Tietz. *American Society for Testing Materials,* Preprint 26, 1949, 17 pages.

3S-H12, 3S-H18, 52S-H32, 52S-H38, 61S-T6, and 24S-T3 were investigated. From 90 to 400° F., the above sequence of alloys was found to be in order of increasing resistance to creep and stress rupture. Cold rolling appears to have a beneficial effect. The data for 3S-H12 and also 3S-H18 are analyzed in terms of Hollomon's theory of creep. Results did not correlate well with experiment.

3D-44. The Creep Strength at 200 C. of Some Magnesium Alloys Containing Cerium. G. A. Mellor and R. W. Ridley. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 679-692.

A number of the alloys were tested as cast, as rolled, and as rolled and heat treated. Little advantage was gained by increasing the Ce content beyond 1½-2%. Rolled alloys are markedly inferior to cast alloys unless they are solution treated. Slight age hardening took place in alloys containing 0.5-6% Ce.

3D-45. Properties of Heat-Treatable Aluminum Alloys Used for Drawing and Spinning; Properties of Non-Heat-Treatable Aluminum Alloys Used for Drawing and Spinning. *Machinery,* v. 55, June 1949, p. 253.

Ultimate tensile strengths, yield strengths, elongations for 1/16-in. sheet, and Brinell hardnesses.

3D-46. 75S Aluminum Alloy. C. C. Hurlburt. *Materials & Methods,* v. 29, June 1949, p. 83, 85.

Available forms, chemical composition, corrosion resistance, mechanical and physical properties, processing and fabrication, thermal treatment, and minimum bend radii.

3D-47. Les renseignemenst fournis par des essais de fatigue sur l'état cristallin des toles. (Information Concerning the Crystalline State of Sheet Metal Obtained From Fatigue-Test Data.) R. Jacquesson and P. Laurent. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 89-99; discussion, p. 100-101.

Resistance to dynamic stress of Al sheet was studied as a function of crystal orientation and degree of cold working. The evolution of the crystalline state as a function of the frequency of stress application (in this case, 9000 cycles per min.).

3D-48. (Book) **Aluminium and Its Alloys.** S. A. J. Sage. Emmott & Co., Ltd., 31 King St. West, Manchester 3, England. 2s. 6d. net.

Normal range of Al alloys and their associated mechanical properties. The alloys dealt with include Al alloyed with Cu, Si, Mg, and Zn, plus the more complex alloys. Both castings and forgings.

3D-49. Inelastic Scattering of Protons by Magnesium and Aluminium. E. H. Rhoderick. *Nature,* v. 163, May 28, 1949, p. 848-849.

Including some work on scattering by Be.

3D-50. Some Effects of Silicon on the Tendency to Cracking in Aluminium-Copper-Magnesium Alloys of High Purity. W. I. Pumphrey and D. C. Moore. *Journal of the Institute of Metals,* v. 75, May 1949, p. 727-736.

It was found that there is marked progressive reduction in susceptibility to cracking of alloys containing 2.5-4% Cu and 0.5-1% Mg with increase in Si content from 0.5-4%. When such alloys are to be used for welding, Si content should be as high as practicable, of the order of 1.5%, consistent with successful heat-treatment, and Cu content as high as permissible within the specified range. 10 ref.

3D-51. Effect of Magnesium on Aluminum-Copper-Silicon Casting Alloys. R. A. Quadt and J. J. Adams. *Foundry,* v. 77, July 1949, p. 88-90, 240.

Effect of Mg on the mechanical properties of aluminum casting alloys containing 3-5% Cu and 5-8% Si. Effect of stress-relieving heat treatment at 450° F.

3D-52. Liquid Solubility of Manganese in a Magnesium-Aluminum-Tin Alloy. B. J. Nelson and G. F. Sager. *Journal of Metals,* v. 1, sec. 3, July 1949 *(Metals Transactions,* v. 185), p. 405-408.

Compositions and properties of Mg forging alloys, Mn segregation in AM65S, liquid solubility determinations, and effect of Mn on tensile properties and resistance to corrosion.

3D-53. Hot-Tearing. Factors Controlling Its Incidence in Aluminium Alloys. D. C. G. Lees. *Metal Industry,* v. 74, June 24, 1949, p. 507-509.

The freezing process; tensile test results; the concept of "eutectic index," showing the relationship of proportion of eutectic present to hot-tearing behavior.

3D-54. Die Mikrohärte rekristallisierender Aluminiumbleche. (The Microhardness of Recrystallized Sheet Aluminum.) Hans Joachim Wallbaum and Renate Misoher. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 179-182.

Proves by microhardness measurements that the recrystallization of very pure Al is a sudden process and that the hardness values are much more consistent if deformation starts with a monocrystal.

3D-55. Mechanical Tests and the Working Properties of Metals. G. Fitzgerald-Lee. *Aircraft Engineering,* v. 21, July 1949, p. 220-221, 226.

Notes on the use of test data in the choice of materials with particular reference to aluminum and its alloys.

3D-56. Magnesium Alloys and Applications. John C. McDonald. *ASTM Bulletin,* July 1949, p. 67-69.

Properties and applications.

3D-57. Creep Strength of Some Magnesium Alloys. G. A. Mellor and R. W. Ridley. *Engineering,* v. 168, July 29, 1949, p. 120.

Previously abstracted from *Journal of the Institute of Metals,* item 3D-44, 1949.

3D-58. Analysis of the Temperature Coefficient of Shear Modulus of Aluminum. T'ing-Sui Kê. *Physical Review,* ser. 2, v. 76, Aug. 15, 1949, p. 579.

The shear modulus of a specimen of cubic symmetry may be regarded as an implicit function of temperature (through its volume) and as an explicit function. It thus consists of two terms. The contribution of each term is estimated for an Al crystal which is fairly isotropic.

3D-59. Die latente Verfestigung in gedehnten Aluminiumkristallen. (The Latent Strength Increase in Elongated Aluminum Crystals.) Fritz Röhm and Albert Kochendörfer. *Zeitschrift für Naturforschung,* v. 3a, Dec. 1948, p. 648-656.

Experiments were made to determine the effect of stressing. Results show that the strength increase is primarily a function of the angle of inclination of the slip planes to the direction of tensile stress.

3D-60. Die Wärmebeständigkeit der Leichtmetalle. (The Heat-Resistance of the Light Metals.) A. Schimmel. *Archiv für Metallkunde,* v. 3, June 1949, p. 212-213.
The properties and treatment of heat resistant Al alloys and methods of testing their strength properties at elevated temperatures.

3D-61. Boron Hardening of Steel. Nature of Action in Various Alloys. *Chemical Age,* v. 61, Aug. 6, 1949, p. 195-196.
Methods for testing and limiting factors. Based on research of the U. S. Bureau of Standards.

3D-62. Factors Controlling the Hot-Tearing of Aluminium Casting Alloys. D. C. G. Lees. *Foundry Trade Journal,* v. 87, Aug. 18, 1949, p. 211-218, 220.
11 ref. Previously abstracted from *Metal Industry.* See item 3D-53, 1949.

3D-63. Magnesium-Zirconium Alloys; Mechanical Properties at Elevated Temperatures. C. J. P. Ball. *Metal Industry,* v. 75, Aug. 19, 1949, p. 152-153.
Compositions, physical properties, and methods of working.

3D-64. Stress-Strain Relations in the Plastic Range for Biaxial Stresses. Joseph Marin. *Journal of the Franklin Institute,* v. 248, Sept. 1949, p. 231-249.
See abstract from *National Advisory Committee for Aeronautics,* Technical Note No. 1889, item 3D-35, 1949.

3D-65. Effect of Steady Stress on Fatigue Behavior of Aluminum. J. A. Sauer and D. C. Lemmon. *American Society for Metals,* Preprint No. 29, 1949, 18 pages.
Fatigue behavior, under alternating bending and alternating torsion of 14S-T; in particular, the effect of static mean stress on fatigue strength. 10 ref.

3D-66. Magnesium Alloy Developments. *Modern Metals,* v. 5, Sept. 1949, p. 20.
Effects of adding Zn, Zr, Ce, and Mn on properties of Mg alloys.

3D-67. New Departure Discusses Ball Bearing Mountings in Aluminum Housings. *Modern Metals,* v. 5, Sept. 1949, p. 26-27.
Fit and standard bearing tolerances. Favorable qualities of Al for machine parts, and ways to circumvent its less desirable qualities. Five types of housing lines; guild saw equipped with New Departure ball bearings.

3D-68. How To Use High-Strength Aluminum Alloy. E. C. Hartmann, F. M. Howell, and R. L. Templin. *Aviation Week,* v. 51, Oct. 10, 1949, p. 21-22, 24-25, 27-28, 33-34, 38.
Mechanical properties and test methods. 31 ref.

3D-69. Honeycomb-Sandwich Structures. II. H. C. Engel and T. P. Pajak. *Product Engineering,* v. 20, Oct. 1949, p. 131-134.
Effects of environment conditions on the physical properties of Al and fabric core of sandwich structures. Acoustical and heat insulation properties that show promise for engineering application.

3D-70. Aluminum-Zinc-Magnesium-Copper Casting Alloys. L. W. Eastwood and L. W. Kempf. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 100-111; discussion, p. 112-115.
Previously abstracted from *American Foundrymen's Association,* Preprint 48-12. See item 3d-21, 1948.

3D-71. Effect of Titanium on Grain Size and Tensile Properties of an Aluminum, 4.5 Per Cent Copper (No. 195) Casting Alloy. W. E. Sicha and R. C. Boehm. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 398-408; discussion, p. 408-409.
Previously abstracted from *American Foundrymen's Association,* Preprint 48-16. See item 3d-22, 1948.

3D-72. Magnesium Casting Alloys: Typical Properties. *Materials & Methods,* v. 30, Oct. 1949, p. 93.

3D-73. Beitrag zur Kreuzschweissprüfung von Leichtmetallblechen geringer Dicken. (Transverse Weld Testing of Thin Sheets of Light Metal.) Friedrich Erdmann-Jesnitzer. *Zeitschrift für Metallkunde,* v. 39, Dec. 1948, p. 385-390.
The tendency of seven different Al-Mg alloys (1-3 mm. thick) to weld cracking. Welding properties vary considerably with thickness and composition. Behaviors were compared with those of sheet steel. 12 ref.

3D-74. Transmission and Reflection Coefficients of Aluminium Films for Interferometry. M. F. Crawford, W. M. Gray, A. L. Schawlow, and F. M. Kelly. *Journal of the Optical Society of America,* v. 39, Oct. 1949, p. 888.
The films were deposited by evaporation in vacuum, using both low and high rates. Results are measured.

3D-75. Ueber Standard-Aluminiumgusslegierungen. (Concerning Standard Aluminum Cast Alloys.) August Buckeley. *Die neue Giesserei,* v. 36 (new ser., v. 2), Sept. 1949, p. 269-273.
The term "standard alloys" is defined. Compositions, properties, melting and casting methods for six different alloys, compared with the physical and machining properties of cast iron. 12 ref.

3D-76. Factors Affecting the Tensile Notch Sensitivity of Magnesium Alloy

Extrusions. I. Cornet. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 322-344.

Previously abstracted from *Metals Technology.* See item 3d-54, 1948.

3D-77. Absorption of Gamma-Rays in Aluminum. W. C. Parkinson. *Physical Review,* ser. 2, v. 76, Nov. 1, 1949, p. 1348-1352.

Scattering cross section for gamma-rays in Al was measured by two independent methods at three energies. Results are in agreement with predictions of theory within experimental error of $\pm1\%$. 25 ref.

3D-78. Effect of Open Circular Holes on Tensile Strength and Elongation of Sheet Specimens of Some Aluminum Alloys. H. N. Hill and R. S. Barker. *National Advisory Committee for Aeronautics,* Technical Note 1974, Oct. 1949, 40 pages.

Tests were made on 24S-T3, 24S-T81, 24S-T86, 24S-O, Alclad 75S-T6, Alclad 14S-T6, and Alclad 14S-T3 Al-alloy sheet specimens having a ratio of hole diameter to thickness of sheet of 3.

3D-79. Some Preliminary Information of Buckling and Ultimate Strength of Unstiffened Compression Skin Obtained Through Bending and Compression Tests on Rectangular Cross Section Aluminum Tubes. Roger A. Anderson. *Aeronautical Research Institute of Sweden* (Stockholm), Report No. 27, 1949, 25 pages.

A comparison between theoretical and experimental buckling and maximum stresses developed in pure compression and in compression due to bending.

3D-80. The Flow and Fracture Characteristics of the Aluminum Alloy 24S-T After Alternating Tension and Compression. S. I. Liu and G. Sachs. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 193-204.

Previously abstracted from *Metals Technology.* See item 3d-34, 1948.

3D-81. The Room and Elevated Temperature Properties of Some Sand Cast Magnesium-Base Alloys Containing Zinc. T. E. Leontis. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 287-321.

Previously abstracted from *Metals Technology.* See item 3d-33, 1948.

3D-82. (Book) **New Magnesium Alloys.** 243 pages. 1949. Library of Congress, Photoduplication Service, Publication Board Project, Washington, D. C. Photostat, $31.25; microfilm, $9.00.

A comprehensive survey of the mechanical properties of some 200 alloys in 40 Mg alloy systems, representing results of a study undertaken by Rensselaer Polytechnic Institute for the Air Force.

3D-83. Relief of Residual Stress by a Single Fatigue Cycle. W. P. Wallace and J. P. Frankel. *Welding Journal,* v. 28, Nov. 1949, p. 565s.

Applied to a specimen of 61S Al alloy. Correlation of results with those of other investigators.

3D-84. L'endurance des métaux légers. (Fatigue Strength of Light Metals.) Raymond Boccon-Gibod. *Revue de l'Aluminium,* v. 26, Sept. 1949, p. 278-286.

Factors responsible for variation in fatigue strength; nonmetallic inclusions, pores and blowholes, heterogeneous grain structure, surface defects, stress concentrations related to shape of the part, etc.

3D-85. Über die technologischen Eigenschaften von Aluminium-Kupfer-Silizium - Magnesium - Gusslegierungen. (The Technological Properties of Aluminum - Copper - Silicon - Magnesium Cast Alloys.) Gustav Siebel. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 349-354.

Effects of Mg, Si, Cu, Fe, and Mn on the strength properties of Alcoa 355 alloy (4.5-5.0% Si, 1.2-2.87% Cu, 0.4-0.6% Mg, 0-1.0% Mn, 0.6% Fe, 0.05% Zn, 0.2-0.25% Ti, 0-1.0% Ni, remainder Al). Uniformly high strength properties were obtained if the melts were degassed with chlorides, or if they were treated in a vacuum with chlorine. Heat treating was found to increase strength at the expense of elongation.

3D-86. Effect of Prestraining Temperatures on the Recovery of Cold Worked Aluminum. T. E. Tietz, R. A. Anderson, and J. E. Dorn. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 921-926.

Mechanical properties of cold worked metals depend not only on instantaneous values of strain, strain rate and temperature, but on the entire past history of temperature and strain rate during prestraining. Observations appear to suggest that lower temperatures of prestraining induce formation of smaller or otherwise more readily activated dislocations.

3D-87. Some Observations on the Recovery of Cold Worked Aluminum. T. V. Cherian, P. Pietrokowsky, and J. E. Dorn. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining*

and Metallurgical Engineers, v. 185), p. 948-956.

Effects of recovery on various physical and mechanical properties have been extensively studied. Here effects on the true stress-strain curve were investigated. Effects of different temperatures and prestrains on 2S-O aluminum. Two types of recovery designated as "meta" and "ortho" were distinguished, indicating that the work hardened state is characterized by at least two essentially distinct types of imperfections. 16 ref.

3D-88. The Properties of Sand Cast Magnesium-Rare Earth Alloys. Thomas E. Leontis. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 968-983.

Magnesium was alloyed with commercial Mischmetal, cerium-free Mischmetal, didymium, cerium, lanthanum, and praseodymium. Actual compositions of the materials (which were far from pure in any case). Structure and mechanical and physical properties of as-cast and heat-treated forms. 18 ref.

SECTION IV

CONSTITUTION and STRUCTURE

4A—General

4A-1. The Growth of Crystals. G. P. Thomson. *Proceedings of the Physical Society,* v. 61, Nov. 1, 1948, p. 403-416.

Fundamental mechanisms involved. 32 ref.

4A-2. Nondiffusional (Martensite) Transformations in Alloys (In Russian.) G. V. Kurdyumov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics) v. 18, Aug. 1948, p. 999-1025.

The nature of martensite and the nature of the transformation of austenite into martensite during heat treatment as applied to ferrous metals and to copper alloys (supersaturated alpha phase). Mechanism of the transformation was studied by X-ray and micrographic methods. Illustrated by constitutional diagrams, tables, and micrographs. 50 ref.

4A-3. Ein Beitrag zur Kenntnis ternärer Phosphorlegierungen (On Ternary Phosphate Alloys.) H. Nowotny and E. Henglein. *Monatshefte fur Chemie und verwandte Teile anderer Wissenschaften,* v. 79, Oct. 1948, p. 385-393.

A study of the structures of the Cr-Mn-P, Cr-Fe-P, Cr-Ni-P, Mn-Fe-P, Mn-Ni-P, Fe-Ni-P, Cr-Cu-P, Mn-Cu-P, Fe-Cu-P, and Ni-Cu-P systems. 16 ref.

4A-4. Anwendung des Bandmodells der Elektronentheorie auf die Kristallchemie der Legierungen. II. Ein Beitrag zur Raumchemie der festen Stoffe. (Application of Electron-Theory Bond Models to the Crystal Chemistry of the Alloys. II. A Contribution to the Structural Chemistry of Solids.) Konrad Schubert. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 88-96.

Shows that it is possible to discover new relationships within metallic and nonmetallic crystal structures by means of the above. 41 ref.

4A-5. Gaz et metaux. (Gases and Metals.) (Concluded.) Henry Lepp. *Le Vide,* v. 3, July-Sept. 1948, p. 463-468.

The reaction of nitrogen with commonly used metals and oxygen gas-metal complexes. Obtained compounds and their physical and chemical characteristics. 17 ref.

4A-6. Systematization of Certain Binary Metallic Equilibrium Diagrams. H. J. Axon. *Nature,* v. 162, Dec. 25, 1948, p. 997.

Available data on binary systems in which no intermediate compounds are formed were examined in attempt to systematize knowledge of factors which influence the form of binary equilibrium diagrams. Two types of systems were encountered: those having a region of liquid immiscibility and those having a eutectic. "Size factors" for each system were plotted against "temperature factors." This resulted in discovery of certain systematic relationships.

4A-7. (Book). **Hydrogen in Metals.** Donald P. Smith. 366 pages. 1948. University of Chicago Press, Chicago 37, Ill. $10.00.

Second of series of monographs on various aspects of the science of metals consists of a critical correlation of all significant published data relating to the physical chemistry of hydrogen-metal systems. Does not deal with industrial aspects, and such topics as adsorption and catalysis have been omitted. 1467 ref.

4A-8. (Book). **Crystal Structures. Section 1.** Ralph W. G. Wyckoff. Unpaged. 1948. Interscience Publishers, 215 Fourth Ave., New York 3, N. Y.

The first section of a loose-leaf compilation to consist of three sections. Supplements and replacement sheets will be issued from time to time to bring the material up to date. The book is divided into chapters, and in each chapter the ma-

terial is subdivided into text, tables, illustrations, and bibliography.

4A-9 (Book). **Electrons, Atoms, Metals and Alloys.** William Hume-Rothery. 377 pages. 1948. Published by Louis Cassier Co., Ltd., and distributed by Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E. 1, England. 25s. (postage, 6d.)

Intended for the non-mathematical reader. Divided into four parts dealing with structure of atoms, metals, alloys, and atomic nuclei. Presented in the form of a dialogue between an "older metallurgist" and a "young scientist," bringing out clearly the contrast between the old and new viewpoints. Although written primarily for the metallurgical reader, the book also serves as an elementary introduction to modern atomic theory.

4A-10. The Designation of Phases in Alloy Systems. Francis B. Foley. *Metal Progress,* v. 55, Jan. 1949, p. 59.

Recommends formation of international committee for standardization of the above.

4A-11. The Designation of Phases in Alloy Systems. Taylor Lyman. *Metal Progress,* v. 55, Jan. 1949, p. 62-64.

Referring to Francis B. Foley's suggestion (see above abstract), the secretary of the ASM Committee on Phase Diagrams and editor of Metals Handbook reviews some of the difficulties that have prevented a consistent nomenclature.

4A-12. Twin Crystal Inclusions in Aluminium and Iron. *Nature,* v. 163, Jan. 8, 1949, p. 62.

Hugh O'Neill points out in connection with a recent paper by W. May, T. J. Tiedema, and W. G. Burgers that he reported 20 years ago concerning ferrite crystals embedded in large recrystallized grains of iron, which were twins of the parent. (The latter authors described a similar phenomenon in aluminum.)

4A-13. Uber die Gefugeänderung von Kristalloberflächen durch Bearbeitung abhängig von der Härte. (The Effect of Hardness on the Structural Changes of Crystal Surfaces Caused by Working.) K. H. Leise. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 258-263.

Disproves Beilby's theory of a liquid-like surface film caused by mechanical working (such as polishing).

4A-14. Unit Cell Dimension of Face-Centered Cubic Chromium Hydride and Space Groups of Two Chromium Hydrides. Clovd A. Snavely and Dale A. Vaughan. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 313-314.

A new value of 3.8605±0.0005 A. for the lattice parameter of F.C.C. chromium hydride is reported. Structures are postulated for the F.C.C. and H.C.P. chromium hydrides. Argument is presented to refute the concept that chromium is allotropic.

4A-15. The Effect of Orientation Difference on Grain Boundary Energies. C. G. Dunn and F. Lionetti. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 125-132.

Eleven flat specimens of silicon ferrite each composed of three grains were prepared having (110) planes in the plane of the samples. Each sample was annealed at 1300-1400° C. until further change in grain boundaries seemed unlikely and equilibrium angles apparently had been obtained. Grain boundary angles were measured and relative surface tensions calculated. A curve was obtained showing variation of relative energy in the grain boundary per unit area with difference in crystal orientation.

4A-16. Solid Nuclei in Liquid Metals. Cyril Stanley Smith. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 204.

Theory which postulates that every crystal, containing minute amounts of any of a wide range of impurities, automatically engenders particles having the correct surface structure to serve as nuclei for subsequent solidification. This theory is said to be applicable to any system: metallic, organic, or inorganic.

4A-17. Elektrische Uberfuhrungsmessungen zur Untersuchung der Heteropolarität fester intermetallischer Phasen. (Electrical Transfer Measurements for Investigation of the Heteropolarity of Solid Intermetallic Phases.) O. Kubaschewski and K. Reinartz. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, Mar. 1948, p. 75-86.

In earlier experiments it was discovered that in alloys not only the electrons but also the atom cores or ions participate in the transfer of electric currents. Experiments were made using Mg-Bi alloys in order to expand the theory of "transfer number" to phases with partial metallic conductivity. The part played by the electron gas in the conduction of electric current. 15 ref.

4A-18. Deformation of Crystals by the Motion of Single Ions. F. R. N. Na-

barro. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p 75-90.

A homogeneous stress exerts no force on a vacant lattice site or interstitial ion, and previous estimates of the rate of deformation of a solid due to the migration of lattice defects under stress must be rejected. Surface forces alter the concentrations of defects; and their diffusion from one part of the surface to another leads to a rate of creep dependent on the size of the specimen. The assumption of a mosaic structure removes many of the difficulties, but micro-creep in tin cannot be thus explained. Mechanisms of creep under nonuniform stress and their order of magnitude. Creep phenomena to be expected under neutron bombardment. 24 ref.

4A-19. Recovery and Recrystallization as Processes of Dissolution and Movement of Dislocations. W. G. Burgers. "Report of a Conference on Strength of Solids," *The Physical Society,* 1948, p. 134-136; discussion, p. 136-137.

Recovery is confined to that stage of annealing which is not accompanied by "visible" structural changes, whereas recrystallization is used to denote the appearance and growth of new crystals, eventually followed by "secondary" grain-growth. Recovery versus recrystallization and their dependence on time and temperature of heating; block structure of the crystalline state; and dissolution and movement of dislocations under heat treatment.

4A-20. The Rate of Approach to the Ordered State in Alloys. Louis Weil. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 138-140.

The rate in alloys such as PtFe is much increased if they are produced in powdered form by the reduction of platinocyanides. This is cited as evidence that diffusion in alloys is due to the motion of vacant lattice points or of similar imperfections.

4A-21. Physical Metallurgists. R. L. Fullman and D. Turnbull. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 98-106.

Developments in physical metallurgy during 1948, including work on deformation, grain growth, transformations, and properties of semiconductors.

4A-22. Quantitative Predictions From Dislocation Models of Crystal Grain Boundaries. W. Shockley and W. T. Read. *Physical Review,* ser. 2, v. 75, Feb. 15, 1949, p. 692.

Dislocation models of grain boundaries have certain quantitative consequences which are directly susceptible to experimental test, so that theoretical and experimental investigations of grain boundaries may furnish a direct proof of the presence of particular arrays of dislocations in solids. Of particular interest are grain boundaries between crystallites differing by a small angular rotation about an important crystallographic direction.

4A-23. Couche de Beilby. Comparaison des preuves électrostatiques et électroniques de son existence. (The Beilby Layer. Comparison of Electrostatic and Electronic Evidence of the Existence of the Beilby Layer.) F. J. Taboury. *Journées des Etats de Surface,* 1946, p. 40-43; discussion, p. 43.

Comparative investigation shows the existence of the Beilby layer under certain conditions. Mechanisms of its formation and dissociation.

4A-24. The Principles of the Interpretation of X-Ray Photographs of Imperfect Crystals. H. Lipson. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 35-44; discussion, p. 375-397.

The reciprocal lattice of a crystal is a representation of the diffraction pattern of that crystal: it is particularly useful in considering X-ray diffraction by imperfect crystals. The relevant theory is applied to experimental work on the nature of plastic deformation in metals. Results indicate that the broadening of the X-ray reflections is almost entirely due to the presence of "microstresses". 13 ref.

4A-25. Internal Stresses Arising From Transformations in Metals and Alloys. F. C. Thompson. *Intsitute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 227-232; discussion, p. 432-462.

Effects of the internal stresses thus set up in ferrous and nonferrous alloys may modify appreciably the course of the transformations themselves. 18 ref.

4A-26. Diffusion and Precipitation in Alloys. F. R. N. Nabarro. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 237-250; discussion, p. 432-462.

The theoretical mechanism of diffusion, and factors governing the shape and size of the precipitate. The effects of internal stresses on diffusion and precipitation, and of precipitation on the mechanical properties. 56 ref.

4A-27. Relations d'orientation entre monocristaux métalliques de recristallisation et petits cristaux inclus. (Relationship of the Orientation Between Metallic Recrystallized Monocrystals and Small Crystalline Inclusions.) Paul Lacombe and Aurel Berghezan. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 1-6.

The above was investigated for 99.99% Al, Armco 99.8% Fe, and an Al-Zn solid solution using X-ray diffraction. The presence of two types of small crystalline inclusions was established. Their structure and mechanism of formation.

4A-28. Sur l'existence de petits cristaux isolés dan les monocristaux métalliques de recristallisation et leurs relations d'orientation. (Existence of Isolated Small Crystals in Metallic Monocrystals After Recrystallization and Their Orientation Relationships.) Paul Lacombe and Aurel Berghezan. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 93-95.

The presence of above small crystals (called, by Burgers, "inclusions") in aluminum and iron alloys. Their structure is that of a crossed-twin crystal with similar orientation to that of the large surrounding crystals. Mechanism of the formation of such crystals.

4A-29. Atomic Structure of Metals. H. H. Bleakney. *Canadian Metals and Metallurgical Industries,* v. 12, Mar. 1949, p. 14-17, 26, 28-29.

Elementary explanation of crystal, molecular, and atomic structure; equilibrium diagrams and transformations.

4A-30. Role of Dislocations in Crystal Growth. W. K. Burton, N. Cabrera, and F. C. Frank. *Nature,* v. 163, Mar. 12, 1949, p. 398-399.

The theory of Becker and Döring (Germany, 1935) regarding nucleation in the formation of liquid or solid phases from vapor is critically examined. It is concluded that crystals do not grow at low supersaturations unless they contain dislocations. On the other hand, an excessive density of dislocations also inhibits growth, particularly at very low supersaturations.

4A-31. A Grain Boundary Model and the Mechanism of Viscous Intercrystalline Slip. T'ing-Sui Ke. *Journal of Applied Physics,* v. 20, Mar. 1949, p. 274-280.

Study of activation energy associated with viscous intercrystalline slip shows that conventional theories are untenable. A grain-boundary model is described in which the transition region is considered to consist of numerous disordered groups of atoms or diffused holes. Intercrystalline slip occurs through atomic rearrangement by thermal agitation within each "disordered group" by a shear process involving as units of flow only a few atoms. A unified viewpoint as to the mechanism of viscous intercrystalline slip, volume diffusion in metals, and constant-rate creep of metal crystals under small stress. Experiments on the influence of previous deformation and impurities on grain-boundary viscosity. 22 ref.

4A-32. Some Crystal-Boundary Phenomena in Metals. B. Chalmers. *Proceedings of the Royal Society,* ser. A, v. 196, Feb. 22, 1949, p. 64-73.

Techniques for preparing specimens of tin and of lead consisting of two or three crystals with controlled orientations. The direction of formation of the boundary between two crystals is shown to be dependent on the relative orientations of the crystal axes, and to be the result of a variation of the solid-liquid equilibrium temperature with the crystallographic characteristics of the solid surface in contact with the liquid. A qualitative explanation is proposed in terms of a theory of melting and freezing. New observations of the "macromosaic" effect.

4A-33. Zur Theorie der Raum- und Gitterspannungen. (The Theory of Space and Lattice Stresses.) Siegfried Schwaigerer. *Stahl und Eisen,* v. 68, Dec. 2, 1948, p. 483. Based on article by H. Brandenberger, *Schweizerische Bauzeitung,* v. 65, 1947, p. 509-515, 667-670, 681-685.

A brief critical discussion of the theory by which the causes of fracture of tough substances, flow phenomena, the Bauschinger effect, etc., are explained.

4A-34. Uber die Veredlung des Silumins. (Improvement of the Properties of Silumin.) Erich Scheil and Ruth Zimmermann. *Zeitschrift fur Metallkunde,* v. 40, Jan. 1949, p. 24-29.

The effect of supercooling on eutectic crystallization and a method of calculating the degree of supercooling from the shift of the eutectic. The grain refining of silumin and of cast iron is explained as a process of supercooling of the eutectic. It is shown that the sodium in refined silumin may be in the form of two different phases. 13 ref.

4A-35. Généralités sur les textures d'orientation préférentielle. (General Discussion of Structures With Preferred Orientations.) J. Hérenguel. *Revue de Métallurgie,* v. 45, Dec. 1948, p. 505-511.

Explains "preferred orientation". Use of the microscope, after etching, is said to be particularly well suited to analysis of such structures.

4A-36. Macroscopic Description of the Phenomenon of Twinning of Crystals. (In Russian.) M. Lifshits. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Dec. 1948, p. 1134-1143.

Description of the phenomenon based on a theory of the nonlinear relationship between stress deformation tensors. The consequences of requiring mechanical and thermodynamic stability. Obtained results permit satisfactory interpretation of most of the effects observed by Garber. 11 ref.

4A-37. A Dynamical Model of a Crystal Structure. II. Lawrence Bragg and W. M. Lomer. **III.** W. M. Lomer. *Proceedings of the Royal Society,* ser. A, v. 169, Mar. 22, 1949, p. 171-194.

A recent paper by Bragg and Nye described the behavior of an assemblage of bubbles on the surface of a soap solution and its relationship to the behavior of metals under stress. Part II gives results of use of the technique for study of plastic properties. The analogy with metals was best for bubbles of about 1.2 mm. diam. In Part III, maximum shear strain under which a two-dimensional close-packed lattice is stable was calculated in terms of forces between lattice components.

4A-38. Nitrogen and Hydrogen in Metals. *Journal of Metals,* v. 1, sec. 1, Apr. 1949, p. 8-12.

Solubility and effects on structure and properties, with emphasis on steel.

4A-39. The Beryllium-Iron System. R. J. Teitel and Morris Cohen. *Journal of Metals,* v. 1, sec. 3, Apr. 1949, p. 285-296.

A study of the entire system from 0 to 100% Fe. Experimental vacuum furnace used for thermal analysis and solution quenching. Photomicrographs and X-ray diffraction patterns; phase diagrams.

4A-40. Neutron Diffraction Studies of Order-Disorder in Alloys. C. G. Shull and Sidney Siegel. *Physical Review,* ser. 2, v. 75, Apr. 1, 1949, p. 1008-1010.

Neutron-diffraction techniques were used to study order in the substitutional solid solutions FeCo, Ni_3Mn, and Cu_3Au. Superlattice effects were found in the first two examples, which are difficult to study by X-rays.

4A-41. The Liquidus Curve for Aluminum in Mercury. Herman A. Liebhafsky. *Journal of the American Chemical Society,* v. 71, Apr. 1949, p. 1468-1470.

The above curve was completed by making measurements designed to give good results with dilute Al amalgams. Diagram of apparatus.

4A-42. Theoretical Study of the Diffusion Constant for Self-Diffusion in Metals. M. Leichter. *National Advisory Committee for Aeronautics,* Technical Note No. 1856, Apr. 1949, 14 pages.

An expression is derived, based on the assumption that self-diffusion occurs by the vacancy mechanism. Important factors were found to be characteristic frequency of vibration of the atoms, crystal structure, lattice constant, heat of fusion, temperature, and activation energy for an atomic jump. Comparison of calculated values with the limited experimental data available shows that they are of the correct order of magnitude.

4A-43. On the Directional Character of the Long-Range Order Parameter. Louis Gold. *Physical Review,* ser. 2, v. 75, Apr. 15, 1949, p. 1265.

Points out that a significant aspect of the state of long-distance order in alloys, which apparently has been totally ignored, is the possible directional character of superlattice formation.

4A-44. Crystallite Theory of Strength of Metals. W. A. Wood and W. A. Rachinger. *Journal of the Institute of Metals,* v. 75, Mar. 1949, p. 571-594.

Evidence is presented for the belief that the metallic grain contains a fundamental unit of structure below which it cannot be broken down by plastic deformation at room temperature. The lower limiting size of the unit, termed "crystallite", has a characteristic value for a given metal. This size was determined for a group of body-centered cubic metals—Fe, Mo, Ta, and W—and ultimate tensile strengths were calculated on the basis of the above hypothesis. Measurement of crystallite size was accomplished by X-ray diffraction methods which utilize two recent developments to avoid complications of internal strains. 25 ref.

4A-45. Retrograde Solubility Curves Especially in Alloy Solid Solutions. J. L. Meijering. *Philips Research Reports,* v. 3, Aug. 1948, p. 281-302.

Using Gibbs' entropy of mixing and Richards' rule for the entropy of fusion of metals, a graph is derived thermodynamically, which serves to predict from eutectic concentration of the liquid and coexisting solid solubility at the eutectic temperature whether a solidus in a binary alloy system is retrograde or not. Agreement was found with solidus curves determined experimentally. Solidus curves in nonmetallic systems, transformation curves in iron alloys, and retrograde solubility in liquids. 37 ref.

4A-46. Kristalle und Kristallwachstum. (Crystals and Crystal Growth.) Dierick Kossel. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 15-42.

Reviews German contributions, 1939-46. 85 ref.

4A-47. Struktur der Metalle. (Structure of Metals.) Ulrich Dehlinger. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 77-83.

Reviews German contributions, 1939-46. 27 ref.

4A-48. Struktur Dunner Schichten. (Structure of Thin Films.) Heinz Raether. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 102-108.

Reviews German contributions, 1939-46. 22 ref.

4A-49. A Resonating-Valence-Bond Theory of Metals and Intermetallic Compounds. L. Pauling. *Proceedings of the Royal Society,* ser. A, v. 196, Apr. 7, 1949, p. 343-362.

The theory differs from older theory in making use of all nine stable outer orbitals of the transition metals, for occupancy by unshared electrons and for use in bond formation; the number of valency electrons is consequently considered to be much larger for these metals than has been hitherto accepted. It has been found possible to develop a system of metallic radii that permits detailed discussion of observed interatomic distances in terms of electronic structure. 15 ref.

4A-50. Electron-Atom Ratios in Alloy Phases as a Monotonic Sequence. A. J. Bradley. *Nature,* v. 163, Apr. 30, 1949, p. 683-684.

Examination of several systems indicates that there is a tendency for many alloy phases to occur when the ratio of the number of free valency electrons agrees with the monotonic sequence $(2n - 1)/n$ where $n = 1, 2, 3, 4, 5, 6, 7$.

4A-51. Internal Stresses in Worked Metals. G. B. Greenough. *Metal Treatment and Drop Forging,* v. 16, Spring, 1949, p. 58-64.

Lattice strains measured by X-ray techniques in plastically deformed metals. 15 ref.

4A-52. Anisotropic Plastic Flow. J. C. Fisher. *Transactions of the American Society of Mechanical Engineers,* v. 71, May 1949, p. 349-356.

Experimental data concerning the plastic flow of anisotropic polycrystalline aluminum indicate that predictions of the anisotropic-flow theory are in good agreement with experiment, and are significantly better than those of distortion-energy theory. Caution is indicated in interpreting the results of combined stress tests by means of the latter theory.

4A-53. The System Iron-Tin: Liquidus Only. A. N. Campbell, J. H. Wood, and G. B. Skinner. *Journal of the American Chemical Society,* v. 71, May 1949, p. 1729-1733.

Eutectic temperature and composition of the above system were determined. The equilibrium curve for the Sn-Fe solid phase in contact with the liquid phase was determined from the melting point of Sn up to 1134° C., the temperature of the miscibility gap. Existence of a miscibility gap was proved and its limits determined from 1134 to 1300° C.

4A-54. The Fundamentals of Recrystallization and Grain Growth. J. E. Burke. *American Society for Metals,* "Grain Control in Industrial Metallurgy", 1949, p. 1-73.

Mechanisms and laws which govern the above. 96 ref.

4A-55. Zur Entstehung der Blockstrukturen elektrolytisch gewachsener Metallkristalle. (The Formation of Block Structures of Electrolytically Grown Metal Crystals.) Hellmut Fischer. *Metaloberfläche,* v. 2, Oct. 1948, p. 219-220.

Effect of moderate currents and inhibitors on the formation of base-oriented structures and the effect of increased currents and intensified inhibitors on the formation of "field-oriented" structures. 13 ref.

4A-56. The Sigma Phase in Ternary Cr-Co-Fe and Cr-Co-Ni Alloys. Paul A. Beck and W. D. Manly. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 354.

New experimental results.

4A-57. On the Bond Lengths and Interatomic Distances in Certain Molecules and Crystals. W. Hume-Rothery. *Proceedings of the Royal Society,* ser. A, v. 197, May 11, 1949, p. 17-27.

Internuclear distances in the crystals of some of the elements at absolute zero were calculated, and the values are examined and compared with those in some molecules. Several whole-number relationships are found to exist between squares of bond lengths and atomic numbers.

4A-58. Application of Similarity to Anelasticity. M. T. Thring. *Nature,* v. 163, May 14, 1949, p. 772-773.

Applies dimensional analysis in an attempt to derive a dimensionless criterion for the ratio of the relaxation time to vibration time. Method which includes the effect of grain size. Discusses work of Ke, Zener, and Mott.

4A-59. Statistical Mechanics of Some Co-Operative Phenomena. C. Domb, *Nature,* v. 163, May 14, 1949, p. 775-776.

Analysis applicable to a number of the above associated with specific heat singularities for which the mathematics is formally similar. These include the Ising model of a ferromagnet, the theory of regular binary solid solutions, and order-disorder transitions in alloys.

4A-60. Mechanism of Creep in Metals. G. R. Wilms and W. A. Wood. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 693-706.

How the mechanism by which a metal deforms at elevated temperatures differs from that at normal temperature, and how the difference depends on the rate of deformation.

4A-61. Symposium sur la structure mosaique des métaux. (Symposium Concerning the Mosaic Structure of Metals.) Ch. Crussard and A. Guinier. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 61-71.

Ideas resulting from a discussion among a group consisting of the authors and Brasseur, Burgers, Coheur, Druyvestein, Homes, Jacquet, Lacombe, Laurent, and Rathenau. Surveys in turn available information obtained by use of X-rays, metallography, and by study of mechanical and physical properties. Conclusions and theoretical considerations. 67 ref.

4A-62. Plastic Deformation and Fracture of Polycrystalline Metals Under Tensile Stress. II. Form of Stress Diagrams of Pure Metals. (In Russian.) G. N. Kolesnikov, V. A. Pavlov, E. S. Yakovleva, and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 62-75.

For eight pure metals (β-Sn, Cd, Zn, Mg, Pb, Al, Cu, and α-Fe) at different temperatures (78° K.-0.8° C.) below the melting point or temperature of phase transformation. Stress diagrams of pure metals may be divided into two basic types: "high-temperature" and "low-temperature".

4A-63. (Book) **Grain Control in Industrial Metallurgy.** J. E. Burke, R. L. Kenyon, Henry Burghoff, and J. T. Hobbs. 279 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

Four educational lectures presented to members of the A.S.M. during the 30th National Metal Congress and Exposition, Philadelphia, Oct. 23-29, 1948. Fundamentals of recrystallization and grain growth, its control in ferrous metals, copper, copper alloys, wrought aluminum, and magnesium products. Individual lectures separately abstracted. 266 ref.

4A-64. (Book) **Structures et Propriétés des Alliages Metalliques.** (Structure and Properties of Metallic Alloys.) L. Guillet. 206 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

Designed for those having a considerable scientific and metallurgical background. Various theories, some of them quite controversial, are discussed on the basis of bibliographic data and results of the author's research. 326 ref.

4A-65. Symmetry Properties of Wave Functions in Crystals. Part I. Two Dimensional Lattices. Part II. Three-Dimensional Lattices. T. Venkatarayudu and T. S. G. Krishnamurty. *Proceedings of the Indian Academy of Sciences,* v. 29, sec. A, Mar. 1949, p. 137-161.

Quantum mechanical considerations for these types of lattice, including symmetry properties of the wave vectors and the sticking of Brillouin zones.

4A-66. Modern Descriptive Theories of Precipitation Processes. H. K. Hardy. *Journal of the Institute of Metals,* v. 75, May 1949, p. 707-726.

The most recent theories. Their interrelation and significance in regard to age hardening. Aspects for which no adequate explanation has yet been offered. 41 ref.

4A-67. Strengths of Metals. H. Lipson and A. R. Stokes. *Nature,* v. 163, June 4, 1949, p. 871.

No experimental method has been suggested for recording directly the pure diffraction broadenings of X-ray reflections; there is always an appreciable amount of broadening due to experimental conditions. In any statement of results, therefore, it is essential that the procedure used be stated. Comments on the fact that Wood and Rachinger's recent letter to *Nature* does not give this information. Nevertheless, striking agreement was obtained for the yield stresses of a number of metals when the values of Wood's "limiting crystallite size" are substituted in Bragg's theoretical expression. This agreement results also from the theory that the broadening of the reflections is due to inhomogeneous internal stresses. 10 ref.

4A-68. (Book) **Alloy Systems.** James Osborn Lord. 380 pages. 1949. Pitman Publishing Corp., 2 West 45th St., New York 19. $5.00.

A textbook intended to bridge the gap between elementary physics and chemistry courses and fundamental concepts. The latter include the phase rule and binary phase diagrams, thermochemical equilibrium, mass-action equations, and atomic structure of crystals. Describes different types of binary equilibrium diagrams, giving precise instructions for their interpretation. Chapters are supplemented with questions and problems.

4A-69. (Book) **Structure and Properties of Alloys.** Ed. 2. R. M. Brick and Arthur Phillips. 485 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $6.00.

This edition has been expanded to include new material, discussion of additional alloys, and expansion of sections for fuller understanding. Presents correlation of phase diagrams, structures, and properties of alloys, proceeding from the simplest to the most complex alloys. Photomicrographs illustrate normal structures, their origins, deviations caused by mistreatments, etc.

4A-70. On the Structure of the High Temperature Metals. Russell Franks. "Yearbook of the American Iron and Steel Institute, 1948", p. 509-532; discussion, p. 532-539.

Previously abstracted from *American Iron and Steel Institute,* preprint, item 4A-28, 1948.

4A-71. Feinstruktur der Metalle und Legierungen. (Microstructure of Metals and Alloys.) U. Dehlinger and H. Nowotny. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 1-39.

Comprehensive review of German literature for 1939-46 consists of two sections: "Chemical Physics of Alloys," by Dehlinger; and "Crystal Structure of Intermetallic Phases," by Nowotny. 168 ref.

4A-72. Legierungslehre. (Alloy Science.) O. Kubaschewski, E. Gebhardt, R. Vogel, Th. Heumann, and A. Schrader. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 49-101.

Reviews German literature for 1939-46. Separate sections cover thermochemistry of metals and alloys (Kubaschewski); structure of binary alloys (Gebhardt); of ternary alloys (Vogel and Heumann); and of quaternary alloys (Schrader). 249 ref.

4A-73. Zustandsänderungen. (Changes of State.) E. Scheil, O. Kubaschewski, and W. Hofmann. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 103-123.

Reviews German literature for 1939-46. Separate sections are as follows: properties and crystallization of metal melts (Scheil); diffusion in metals (Kubaschewski); and transformations in the solid state (Hofmann). 79 ref.

4A-74. Plastische Verformung und Rekristallisation. (Plastic Deformation and Recrystallization.) A. Kochendörfer. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 125-145.

Reviews German literature for 1939-46. 107 ref.

4A-75. Nature of Eutectic Alloys. (In Russian.) S. V. Avakyan and N. F. Lashko. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Mar. 1, 1949, p. 29-32.

On the basis of existing experimental data, three conditions for the existence of eutectic alloys are proposed: homogeneity, ability for close contact, and similarity in probability of formation of nuclei in the liquid state. A series of hitherto unexplained phenomena is thus clarified. 30 ref.

4A-76. The Electronic Structure of Metals. (In English.) R. Kronig. *Physica,* v. 15, Apr. 1949, p. 1-12; discussion, p. 11-12.

The development of modern theories.

4A-77. Het ontstaan van tweelingkristallen en hun bouw. (The Formation and Structure of Twin Crystals.) P.

E. A. van Nieuwland. *Metalen,* v. 3, Apr. 1949, p. 182-183.

From a metallographic point of view.

4A-78. The Refinement of Atomic Parameters by the Technique Known in X-Ray Crystallography as "the Method of Steepest Descents." A. D. Booth. *Proceedings of The Royal Society,* ser. A., v. 197, June 22, 1949, p. 336-355.

Three techniques are derived: the "relaxation method" the "least squares" refinement, and method of "steepest descents". These are examined in detail and their virtues and defects noted. Application of the steepest-descent procedure to various types of structure analysis.

4A-79. Effects of Internal Stresses. M. G. Corson. *Metal Progress,* v. 56, July 1949, p. 94, 96, 98, 100, 102, 104.

In previous issues the first 21 papers in the "Symposium on Internal Stresses in Metals and Alloys" (Institute of Metals, London, 1948) were reviewed. The next section consisting of nine papers on effects associated with internal stresses on a microscopic and submicroscopic scale is now considered.

4A-80. Les lois cinétiques de l'adsorption dans le cas particulier de la pénétration superficielle. (Kinetic Laws of Adsorption in the Special Case of Superficial Penetration.) Keith J. Laidler. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D171-D176.

An equation approximating the rate of adsorption and indicates the conditions under which each of two mechanisms determines this rate. The theory is applied to the adsorption of hydrogen by metals and to the formation of oxide films. 22 ref.

4A-81. Theory of Stability of Binary Lattices. (In Russian.) V. A. Zhdanov and N. L. Vishnevskaya. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Mar. 1949, p. 231-234.

The stability of the binary volume-centered lattice. It is shown that, during transition from a monatomic lattice, unstable because of the absence of shear resistance, to a binary lattice, high resistance to shear appears even at very small differences of atomic dimensions.

4A-82. Deformation of the Crystalline Lattice of a Metal Near the Surface. (In Russian.) S. Glauberman. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, Apr. 1949, p. 300-303.

Formula for relative displacements of ionic networks of the crystalline lattice of a metal having a face-centered structure in a direction perpendicular to the boundary surface on the basis of a simplified theory of the average density of the electron gas in each elementary nucleus of a metallic crystal. Also derives an expression for the additional potential developed in the metal in connection with the presence of a boundary surface.

4A-83. Phenomenon of Cleavage. (In Russian.) A. V. Stepsnov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 492-506.

Presents detailed theoretical study, considering that this property is universal and is present in all types of crystals including those of metals, minerals, salts and even organic compounds. Data of investigation indicate that anisotropy of elastic properties is necessary for cleavage. 12 ref.

4A-84. Structural and Elastic Properties of Metals. (In English.) H. Jones. *Physica,* v. 15, Apr. 1949, p. 13-22; discussion p. 21-22.

Properties at low temperatures depend only on the energy of the structure and the way it changes as the crystal is subjected to homogeneous strains. In the theory of Bloch, Wigner, and Seitz, the energy is regarded as a sum of terms which, to a useful approximation, can be calculated separately. Effect of these various contributions in determining the structural type, and particularly the values of the elastic constants of the metals and alloys for which measurements are available.

4A-85. The Resonating-Valence-Bond Theory of Metals. (In English.) Linus Pauling. *Physica,* v. 15, Apr. 1949, p. 23-28.

Previously abstracted from *Proceedings of the Royal Society,* item 4A-49, 1949.

4A-86. The Sizes of Atoms in Metallic Crystals. (In English.) W. Hume-Rothery. *Physica,* v. 15, Apr. 1949, p. 29-33.

Great care is necessary for the sizes of atoms in different structures to be compared directly. The factors originally proposed by Goldschmidt for changes in coordination number must be regarded as rough approximations only and not used for accurate calculation until their exact basis is known. In the same way attempts made to deduce the exact numbers of bonding electrons by simple comparison of in-

teratomic distances must be regarded with suspicion.

4A-87. A Method for Calculating the Energy of a Bloch Wave in a Metal. (In English.) David P. Shoemaker. *Physica*, v. 15, Apr. 1949, p. 34-39.

A mode of procedure which, it is hoped, will reduce the mathematical complexity attending the calculation without introducing too drastic approximations.

4A-88. Slip in Metals. (In English.) Lawrence Bragg. *Physica*, v. 15, Apr. 1949, p. 83-89; discussion, p. 89-91.

Use of "soap-bubble rafts" in the study of metallic crystal structure—a technique by which it has been possible to prepare "models" showing structures analogous to those of slip in metals.

4A-89. Crystal Growth in the Solid State (Recrystallization). (In English.) W. G. Burgers. *Physica*, v. 15, Apr. 1949, p. 92-106.

Lecture covers nucleation and growth; mathematical treatment of the course of recrystallization, mechanism of nucleation and growth, stimulated nucleation, selectivity of the growth process, stoppage of grain growth after primary recrystallization, and recrystallization considered as a process of local melting. 31 ref.

4A-90. Suggestions Concerning Intercrystalline Junction Processes During Recrystallization. (In English.) G. A. Homes and M. Maquestiau. *Physica*, v. 15, Apr. 1949, p. 107-110.

Lattice orientations measured in completely recrystallized iron specimens. All neighboring crystals seem to be twinned. Two types of twin junction between metal grains were observed: direct twinning of two crystals of normal size; and formation of a wedge-form twinned crystal. Observations lead to a scheme for the mechanism of recrystallization phenomena.

4A-91. Transitions in Supercooled Metallic Solutions. (In English.) G. Borelius. *Physica*, v. 15, Apr. 1949, p. 135-147.

Confined to the energetics and kinetics of disorder-order transformations and precipitation phenomena. 24 ref.

4A-92. Microscopic Evidence of Orderly Precipitation in Some Fe-Ni-Al Alloys. (In English.) A. J. Bradley. *Physica*, v. 15, Apr. 1949, p. 175-178.

4A-93. Clustering in Solid Solutions. (In English.) R. Smoluchowski. *Physica*, v. 15, Apr. 1949, p. 179-183.

Part of a general study of fluctuations in solid solutions. Case of binary solid solutions which can be described in terms of interactions between nearest neighbors but in which the two kinds of atoms have different effective ionic radii. The theoretical analysis clears up some puzzling anomalies in the Ag-Cu and Fe-Si systems. 10 ref.

4A-94. Nouvelle theorie de l'agitation thermique. (A New Theory of Thermal Agitation.) C. Crussard. *Physica*. v. 15, Apr. 1949, p. 184-188.

Applicability to study of various reactions in metals caused by thermal movements of atoms or groups of atoms. This theory eliminates some of the difficulties encountered in practical application of the Boltzmann formulas.

4A-95. Investigation of Thermal Dilatation of Cubic Metals. (In English.) A. Kochanovska. *Physica*, v. 15, Apr. 1949, p. 191-196.

The thermal dilatation of chemically pure Fe and Al was measured in different crystallographic directions with the aid of X-rays of three different wave lengths. The results obtained over a range of 22-366° C. showed in the case of iron an anisotropy of thermal dilatation. In the case of Al, no differences of that kind were detected up to 220° C. Suggests that perhaps some of the metals belonging to the cubic crystallographic system are actually not precisely cubic.

4A-96. Diffusie in metalen en legierungen. (Diffusion in Metals and Alloys.) I. and II. J. D. Fast. *Metalen*. v. 3, May 1949, p. 191-195; June 1949, p. 215-222.

First of four articles begins with a simple mathematical treatment of diffusion from the microscopic point of view. After giving a definition of coefficient of diffusion with stationary and nonstationary states of flow, means are discussed for measuring or estimating its value. Second of series discusses the statistical nature and the atomic theory of diffusion. (To be continued.)

4A-97. Residual Lattice Strains in Plastically Deformed Polycrystalline Metal Aggregates. G. B. Greenough. *Proceedings of the Royal Society*, ser. A, v. 197, July 7, 1949, p. 556-567.

Strains observed by X-ray diffraction methods in plastically extended polycrystalline aggregates were investigated. If several diffraction lines are examined, the strains vary both in magnitude and in sign. Theoretical explanation, conclusions from which are in satisfactory agreement with observations.

4A-98. Influence of Magnetic Field on Recrystallization. R. Smoluchowski and

R. W. Turner. *Journal of Applied Physics,* v. 20, Aug. 1949, p. 745-746.

Influence on Fe-Co alloys. Preliminary results indicate a change of the texture which can be qualitatively accounted for by considering the magnetostrictive properties of the alloy and their influence on the stability of the recrystallization centers.

4A-99. Constitution of Melts. J. O'M. Bockris and J. W. Tomlinson. *Research,* v. 2, Aug. 1949, p. 362-368.

Methods and equipment. Structures of liquid metals and salts; experimental evidence and theory of liquid silicate structures. 64 ref.

4A-100. Conception nouvelle concernant les transformations de l'acier. (A New Conception Concerning the Transformations of Steel.) J. H. Andrew. *Revue de Métallurgie,* v. 46, Apr. 1949, p. 233-236.

On the basis of the proposed theory and experimental data, the various transformations which take place in different carbon and alloy steels are explained.

4A-101. Anderung des Volumens beim Zerfall binärer Mischkristalle. (Volume Changes Caused by the Dissociation of Binary Solid Solutions.) Alfred Durer. *Zeitschrift für Metallkunde,* v. 40, June 1949, p. 218-219.

A method of calculating from the lattice data of the solid solution the volume change caused by precipitation of its components.

4A-102. On the Range of the ϵ Phase in the Fe-Cr-Mn Ternary System. (In Japanese.) Kenji Ono. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 22-27.

4A-103. Calculations of Simplest Equilibrium Diagrams of Binary Alloys. (In Russian.) B. Ya. Pines. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 625-638.

A method of analytical description of equilibrium diagrams of binary alloys is theoretically investigated. Results explain two experimentally observed types.

4A-104. Mise en évidence des tensions internes et des dislocations dans les métaux par le comportement photoélastique du chlorure d'argent. (Evidence of Internal Stresses and Dislocations in Metals on the Basis of Photo-Elastic Behavior of Silver Chloride.) J. F. Nye. *Revue de Métallurgie,* v. 46, June 1949, p. 371-375; discussion, p. 375-376.

Experiments using AgCl with respect to structural behavior under different forms of plastic deformation, bending, stretching, torsion, etc. These results, which are readily observed because of transparency, are believed analogous to those taking place in polycrystalline metals.

4A-105. Zur Theorie der Erholung. (On the Theory of Recovery.) Doris Kuhlmann, Georg Masing, and Joseph Raffelsieper. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 241-246.

An atomic theory for the recovery of plastically deformed metals. Comparison with experimental results for the recovery of Al monocrystals indicates satisfactory agreement with theory within a rather wide margin of error. 27 ref.

4A-106. Das Gesetz der Gefrierpunktserniedrigung binärer eutektischer Schmelzen durch kleine Zusätze fremder Stoffe. (The Law of the Reduction of the Freezing Points of Binary Eutectic Melts by Small Additions of Foreign Substances.) Erich Scheil. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 246-248.

Reduction of the eutectic temperature of binary alloys follows a law that is analogous to the classical law for reduction of freezing point, provided the addition is slightly soluble in both solid phases. The concentration change of the eutectic point cannot be computed without knowing the heat of miscibility of the ternary system.

4A-107. Zur Theorie der Rekristallisation. (The Theory of Recrystallization.) Kurt Lucke and Georg Masing. *Zeitschrift für Metallkunde,* v. 39, Oct. 1948, p. 291-293.

Petersen's method for computing the growth of nuclei is presented in simplified form. Critical analysis indicates that the validity of his theory becomes doubtful when the radius of the growing nucleus has quintupled.

4A-108. Analysis of Interstitial Diffusion Using Activity Methods. A. G. Guy. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 607-610.

Improved method indicates a possible approach to an adequate treatment of substitutional diffusion. Theoretical and experimental data are compared for carbon diffusing in iron. 10 ref.

4A-109. Beitrag zur graphischen Darstellung quaternarer Systeme. (Graphical Representation of Quaternary Systems.) H. Klemm. *Archiv für Metallkunde,* v. 3, July 1949, p. 247-250.

Method for constructing constitution diagrams of quaternary alloys, with special emphasis on the relation of temperature and concentration.

4A-110. Diffusie in metalen en legieringen. (Diffusion in Metals and Alloys.)

III and IV. (Concluded.) *Metalen,* v. 3, July 1949, p. 239-248; Aug. 1949, p. 261-270.

The mechanism of diffusion in substitutional solid solutions and the influence of interatomic forces upon diffusion. The deleterious effect of hydrogen in iron and steel.

4A-111. (Book) **Rutley's Elements of Mineralogy.** Ed. 24. H. H. Read. 525 pages. Mar. 1947. Thomas Murby & Co., 40 Museum St., W. C., London, England.

Part I consists of chapters on chemistry, certain physical properties, atomic structure, optical properties, and occurrence of minerals, also one on elements of crystallography. Part II gives concise descriptions of the various mineral species. Differs from the previous edition mainly in the addition of the chapter on atomic structure.

4A-112. The Dislocation Theory of Slip. Recent Developments in Britain. F. R. N. Nabarro. *Metallurgia,* v. 40, Aug. 1949, p. 199-205.

Movement of dislocations, transient creep, multiplication of dislocations, solid solutions and precipitation hardening, the bubble model, and interaction of dislocations and dissolved atoms. 19 ref.

4A-113. Interpretation of X-Ray Patterns of Cold-Worked Metal. B. L. Averbach and B. E. Warren. *Journal of Applied Physics,* v. 20, Sept. 1949, p. 885-886.

Experimental technique which makes it possible to measure the shape of a powder pattern line with sufficient accuracy to justify an interpretation based on the shape rather than using just the line breadth.

4A-114. Transitions in Solids and Liquids. L. A. K. Staveley. *Quarterly Reviews,* v. 3, no. 1, 1949, p. 65-81.

Critical review of theory applicable to substances of widely different chemical types, including condensed gases, salts, and alloys. 61 ref.

4A-115. Secondary Recrystallization of Face-Centered Ni-Fe Alloys. G. W. Rathenau and J. F. H. Custers. *Philips Research Reports,* v. 4, Aug. 1949, p. 241-260.

Results of a study of the various orientations found in secondary-recrystallization structures. Normal secondary recrystallization is indicated to be the grain growth of primary crystals with a high temperature of primary recrystallization. The influence of sheet thickness and of gas atmosphere on secondary recrystallization. 14 ref.

4A-116. Comparison of the Perfection of the Crystals of Primary and Secondary Recrystallization. A. Guinier and J. Tennevin. *Philips Research Reports,* v. 4, Aug. 1949, p. 316-318.

The perfection of primary and secondary crystals of Ni-Fe alloys was studied by an X-ray method which allows measurement of deviations of the normals of lattice planes with an accuracy of ¼ min.

4A-117. Über die Teilchengrösse und den Gleitebenenabstand in plastisch verformten Kristallen. (Concerning Particle Sizes and the Slip-Plane Interval in Plastically Deformed Crystals.) Albert Kochendörfer. *Zeitschrift für Metallkunde,* v. 39, Nov. 1948, p. 359-360.

Points out that electron-optically measured slip-plane intervals agree with particle sizes determined by X-rays, agreeing with the assumption that the lattice distortions in the slip planes interrupt the X-ray optical coherence. The light microscope reveals the slip lines only as individual lines at an interval of 1 μ. 11 ref.

4A-118. Theory of Growth of Spherical Precipitates From Solid Solutions. Clarence Zener. *Journal of Applied Physics,* v. 20, Oct. 1949, p. 950-953.

Radius of a spherical precipitate particle growing in a solid solution of initially uniform composition has been shown to be equal to the square root of atomic diffusion coefficient times time, multiplied by a growth coefficient. The precise relationship of this function to pertinent compositions. A similar computation for the coefficient corresponding to one-dimensional growth of a plate.

4A-119. Interstitial Atomic Diffusion Coefficients. C. Wert and C. Zener. *Physical Review,* ser. 2, v. 76, Oct. 15, 1949, p. 1169-1175.

Attempts to interpret the temperature-independent factor D_0 of the previously determined diffusion coefficients of interstitial solute atoms in metals. All past observations except for C and N in α-Fe are consistent with a theoretical range of entropy factors. D_0's for these systems were, therefore, redetermined by more precise measurements, and are found to be higher than the original values. Associated entropy factors are consistent with the theoretical range. 11 ref.

4A-120. The Mechanism of Dilatancy. E. N. da C. Andrade and J. W. Fox. *Proceedings of the Physical Society,* v. 62, sec. B, Aug. 1, 1949, p. 483-500.

The dilatancy in question is the change of over-all volume produced by strain in an assembly of particles.

This was demonstrated for a mixture of sand and water by a photoelectric method of measuring wetness of the surface. The general phenomenon was studied in detail with a two-dimensional hexagonal array of uniform cylinders, part of the free surface of which is loaded with a rigid piston. Elastic stress distribution before slipping takes place was calculated and shown to be a determining factor. Effect of friction between the component units. Experiments were also carried out on three dimensional irregular arrays of carbon shot and of sand.

4A-121. Boundary Migration and Grain Growth. Walter C. McCrone. *Discussions of the Faraday Society,* No. 5 (Crystal Growth), 1949, p. 158-166.

Two types of "boundary migration", which is used as a synonym for grain growth. The two types are known as the DDT Type, in which orientation controls the direction of boundary migration; and the octachloropropane type, in which orientation has little or no effect. Additional work was done on comparison of the rate of growth of octachloropropane at different temperatures with corresponding data for metals systems.

4A-122. Reviews of Certain Aspects of Metal Physics. Part I. X-Ray Work in Some Fields of Research on Metals and Alloys, 1939 to 1946. Audrey M. B. Douglas. **Part II. Thermal Conductivities of Molten Metals and Alloys.** R. W. Powell. *Journal of the Iron and Steel Institute,* v. 162, July 1949, p. 299-324.

270 references.

4A-123. Constitution of Iron-Nickel-Chromium Alloys at 650° to 800° C. W. P. Rees, B. D. Burns, and A. J. Cook. *Journal of the Iron and Steel Institute,* v. 162, July 1949, p. 325-336.

A considerable number of the alloys were prepared containing 40-80% Fe, 0-60% Ni, and 0-50% Cr, using component elements of very high purity. Metallographic and X-ray investigations of alloy structures were made to determine limits of composition at which the sigma constituent did not exist as an equilibrium component after annealing at 650 and 800° C. These limits extend to considerably lower Cr contents than previously stated. Transition from the γ phase to the $(\gamma+\sigma)$ phase was not always a single-stage reaction, but could be preceded by precipitation of an intermediate phase.

4A-124. Further X-Ray Study of the Equilibrium Diagram of the Iron-Nickel System. E. A. Owen and Y. H. Liu. *Journal of the Iron and Steel Institute,* v. 163, Oct. 1949, p. 132-137.

The materials were investigated in powder and in lump form, at room and at elevated temperatures. Effects of contamination and insufficient annealing of the specimens, and of sensitivity of the X-ray method were investigated. The diagram recorded previously by Owen and Sully is largely confirmed.

4A-125. Über das Verhalten von FeS zu den Kobaltsulfiden Co_6S_5 und Co_4S_3. (The Behavior of FeS Toward the Cobalt Sulfides Co_6S_5 and Co_4S_3.) Rudolf Vogel and Ruth Au. *Zeitschrift für Metallkunde,* v. 40, Aug. 1949, p. 290-295.

Phase relationships and solubilities were studied by X-ray and metallographic methods. Lattice parameters are calculated. Includes constitution diagrams.

4A-126. Macromolecular and Micellar Structure of Metals. XI. Colloidal Phenomena in Metals. (In Russian.) Yu. A. Klyachko. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, May 1949, p. 455-466.

Theoretical analysis. Fundamental data for a large number of metals and nonmetals. 21 ref.

4A-127. Quasi-Chemical Theory of Regulation of Binary Alloys. (In Russian.) I. A. Mirtskhulava. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics) v. 19, May 1949, p. 407-412.

A hypothetical binary alloy at a given temperature is assumed to be a mixture of "normal" atoms and alterations of different types. Thermodynamic potentials and equilibrium numbers of alterations of different types are determined. Degrees of remote and close order of the crystal are determined according to this number, as well as drop of thermal capacity during passage through the Curie point.

4A-128. Atomic Magnetic Moments and Interatomic Distances of Metals of the Iron Group. (In Russian.) F. M. Gal'perin. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, May 1949, p. 451-459.

The relation between atomic magnetic moments of solid face-centered cubic metals of the iron group and their interatomic distances. 21 ref.

4A-129. Correlation Between Lattice Transformation and Plastic Flow in Metals. (In Japanese.) Sakae Takeuchi and Hidezi Suzuki. *Nippon Kinozoku Gakkai-Si* (Journal of the Japan

Institute of Metals), v. 13, Apr. 1949, p. 14-18.

Two assumptions on the basis of which a thermodynamic theory of plastic deformation was developed in a preceding report are discussed from the viewpoint of a dislocation model.

4A-130. Strain Hardening Effects of Alloying Elements and Microstructure. G. V. Smith. *American Society for Metals*, "Cold Working of Metals", 1949, p. 2-30.

Various methods of study. Effect on flow strength. 26 ref.

4A-131. Structure of Slip Bands and Cold-Worked Metal. R. D. Heidenreich. *American Society for Metals*, "Cold Working of Metals", 1949, p. 57-64.

Application of electron microscope and electron-diffraction methods to the structure of deformed metals. Surfaces of Al single crystals after plastic deformation. Interprets transmission electron-microscope images of thin Al sections.

4A-132. The Crystallographic Mechanisms of Translation, Twinning and Banding. C. S. Barrett. *American Society for Metals*, "Cold Working of Metals", 1949, p. 65-98.

In pure, stable metals and alloys as affected by cold working 22 ref.

4A-133. Deformation Textures. R. M. Brick. *American Society for Metals*, "Cold Working of Metals", 1949, p. 99-112.

Textures resulting from cold working. Significant variables of the relation between textures and properties. 16 ref.

4A-134. Recrystallization Textures. C. G. Dunn. *American Society for Metals*, "Cold Working of Metals", 1949, p. 113-130.

General principles applicable to the development of strong textures. Cube texture, its development and stability. New information on a texture produced in silicon iron. Both textures form on annealing after fabrication by cold rolling. 32 ref.

4A-135. Dislocation Theory. W. Shockley. *American Society for Metals*, "Cold Working of Metals", 1949, p. 131-147.

Limited aspects of the above which is felt to be in a highly unsatisfactory state as a result of introducing assumptions at various stages of the development.

4A-136. Nucleation of Deformation. J. H. Hollomon. *American Society for Metals*, "Cold Working of Metals", 1949, p. 148-162.

Nucleation of phase transformations and of slips. Transient effects and the mechanical equation of state. 14 ref.

4A-137. The Effect of Strain Histories on the Work Hardening of Metals. T. E. Tietz and J. E. Dorn. *American Society for Metals*, "Cold Working of Metals", 1949, p. 163-179.

Temperature of straining as a factor in determining the amount of work hardening in metals crystallizing in body-centered cubic and close-packed hexagonal systems. Effect of strain rate on strain hardening when temperature is held constant. Some preliminary tests on the effect of thermal-mechanical history on recovery rates. Their possible significance in identifying the influence of temperature of straining.

4A-138. Dynamics of Slip Bands. Clarence Zener. *American Society for Metals*, "Cold Working of Metals", 1949, p. 180-196.

Influence of previously formed slip bands upon the relation between stress and strain under conditions when no new slip bands are being formed. 15 ref.

4A-139. The Effect of Plastic Deformation on Solid Reactions. Part I. Diffusion Reactions. B. L. Averbach. **Part II. The Effect of Applied Stress and Strain on the Martensite Reaction.** B. L. Averbach, S. A. Kulin, and Morris Cohen. *American Society for Metals*, "Cold Working of Metals", 1949, p. 262-319.

As related to cold working. Property and constitution data are tabulated and plotted. 46 ref.

4A-140. Diffusion in Binary Alloys. J. Bardeen. *Physical Review*, ser. 2, v. 76, Nov. 1, 1949, p. 1403-1405.

Diffusion via vacant lattice sites leads to Darken's equations if it is assumed that the concentration of vacant sites is in thermal equilibrium. Modifications required if vacant sites are not in equilibrium.

4A-141. Zur Frage der Einheitlichkeit des Kristallzustandes in kaltgereckten Metallen. (Concerning the Question of Uniformity of Crystal Structure in Cold Drawn Metals.) E. Brandenberger and F. Staffelbach. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Sept. 1949, p. 259-261.

X-ray diagrams are better suited than photomicrographs for determining the degree of plastic deformation of tensile bars, especially when "pulled" at different rates. Photomicrographs and corresponding X-ray diagrams.

4A-142. Determination of Linear Rate of Transformation in Solid Metals. (In Russian.) A. G. Spektor. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 797-799.

Bases of one method of determining rate of growth and of solution of phases in solid metals which permits determining these values for crystals of any shape with a high degree of accuracy. Collision of crystals and formation of polycrystalline junctions do not impede use of this method. Data for solution of carbide phase in austenitic steel at a heating rate of 4° C. per sec.

4A-143. Aspects of Gas-Metal Equilibrium, Interstitial Solution and Diffusion. R. M. Barrer. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 68-81; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 4a-48, 1948.

4A-144. The Constitution of Phases at High Temperature in Relation to Their Thermodynamic Properties. G. M. Willis. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 281-286; discussion, p. 317-344.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 4a-47, 1948.

4A-145. Stable Transformation Nuclei in Solids. J. N. Hobstetter. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 121-130.

Previously abstracted from *Metals Technology.* See item 4a-55, 1948.

4A-146. Nucleation of Slip Bands. J. G. Leschen, R. P. Carreker, and J. H. Hollomon. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 131-138.

Previously abstracted from *Metals Technology.* See item 4a-49, 1948.

4A-147. Transient Plastic Deformation. R. P. Carreker, J. G. Leschen and J. D. Lubahn. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 139-146.

Previously abstracted from *Metals Technology.* See item 4a-50, 1948.

4A-148. Property Changes During Aging. A. H. Geisler. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 230-254.

Previously abstracted from *Metals Technology.* See item 18a-23, 1948.

4A-149. (Book) **Crystal Growth.** *Discussions of the Faraday Society,* no. 5, 1949, 366 pages. Faraday Society, 98 Great Russell St., London, England.

Proceedings of a symposium held Apr. 12-14, 1949. Consists of introductory paper, 7 papers on theory of crystal growth, 13 on nucleation and normal growth, 9 on abnormal and modified crystal growth, 13 on mineral synthesis and technical aspects, and concluding remarks. The bulk of the papers deal with pure theory or with nonmetallic crystals. Three exceptions are abstracted individually.

4A-150. Fundamentals of the Working of Metals. Part V. General Nature of Phase Changes. George Sachs. *Modern Industrial Press,* v. 11, Nov. 1949, p. 6, 8, 50.

Elementary principles.

4A-151. Diffraction by a Screw Dislocation. A. J. C. Wilson and F. C. Frank. *Research,* v. 2, Nov. 1949, p. 541-543.

Calculations intended as an aid in verifying the hypothesis of dislocations which explains many of the properties of cold worked metals and the ease of crystal growth from vapor or solution.

4A-152. The Thermodynamics of the Iron-Nickel Alloys. O. Kubaschewski and Ortrud Von Goldbeck. *Transactions of the Faraday Society,* v. 45, Oct. 1949, p. 948-960.

Thermodynamic data for formation of gamma Fe-Ni alloys were derived from equilibrium measurements between H_2O, H_2, and alloys of various compositions. Corresponding data for the alpha phase were derived from published work on heat content measurements. Thus free-energy curves were calculated and their accuracy estimated. From these curves, phase boundaries were derived. 19 ref.

4A-153. Isothermal Compositional Order-Disorder. I. Superstructure Solid Solutions in a Salt System. Alexander Grenall. *Journal of Chemical Physics,* v. 17, Nov. 1949, p. 1036-1043.

Solid solutions in the system, NH_4Cl-$MnCl_2$-H_2O, exhibit properties characteristic of order-disorder in alloys. The salt system's features resemble those of a low-temperature isotherm across Shockley's theoretical phase diagram for alloy order-disorder transformation. Phenomena in metal and salt systems were further shown by producing the disordered state from the ordered by thermal and cold-working methods. In both instances, order was spontaneously restored on aging at room temperature. 23 ref.

4A-154. Sur les relations entre les textures de laminage et de recristallisation. (Concerning Relationships Between Rolling Structures and Recrystallization.) P. Coheur and J. M. Lejeune.

Revue de Métallurgie, v. 46, July 1949, p. 439-444; discussion, p. 445.

Study of above, using aluminum, verifies the hypothesis of Burgers, according to which the recrystallization structure is due to nuclei formed by crystal fragments undetected by X-rays. Such nuclei possess in deformed metal the same orientation as observed during recrystallization. Secondary recrystallization seems to depend on thickness of the test specimens. Includes pole-figure diagrams and graphs. 11 ref.

4A-155. La valence des métaux et la structure des composés intermétalliques. (Valency of Metals and Structure of Intermetallic Compounds.) Linus Pauling. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 46, May-June 1949, p. 276-284; discussion, p. 284-287.

Recent progress in study of fundamental electronic structure and atomic dimensions.

4A-156. Über die Zellenunterteilung dendritischer Gusskörner. (Cellular Subdivisions in Dendritic Cast-Metal Grains.) Hans Kostron. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 321-332.

Shows that dendritic grains are composed of cells. Intermetallic compounds usually segregate along grain and cell boundaries. Since arrangement of these compounds greatly affects properties of the worked and unworked castings, author proposes that not only the grain sizes but also the cell sizes be determined. Two methods of determining average cell sizes are indicated. 19 ref.

4A-157. Die Verfestigung bei intermetallischen Phasen und Salzkristallen. (Hardening in Intermetallic Phases and Salt Crystals.) Ludwig Graf. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 334-338.

Possible reasons for the absence of plasticity or slip in salts and intermetallic compounds at temperatures of atomic immobility. The effect of different noninterchangeable atom types in the lattice and of processes within the slip plane are theoretically examined. 16 ref.

4A-158. Determination of the Coefficient of Diffusion in Case of a Low Concentration of Diffusing Substance. (In Russian.) B. Ya. Lyubov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1117-1120.

Proposes an equation assuming that the relationship of diffusion coefficient to concentration is linear in character. As an example, the diffusion coefficient of carbon into gamma iron was determined.

4A-159. Concerning the Problem of Crystallization of Metallic Melts. (In Russian.) V. I. Likhtman and B. M. Maslennikov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 93-95.

Results of investigation indicate that, during crystallization of the metallic melt, the most important factor is "collective recrystallization" on the solid-liquid boundary. All of the methods for production of metallic monocrystals from melt or after plastic deformation have, as their basis, the process of "collective recrystallization" and are not affected either by heat transfer or by mold shapes.

4A-160. The Beryllium-Iron System. Robert J. Teitel. *U. S. Atomic Energy Commission,* AECD-2251, Apr. 1948, 89 pages.

See abstract from *Journal of Metals,* item 4A-39, 1949.

4A-161. An Elastic Theory of Dislocations. Elizabeth H. Mann. *Proceedings of the Royal Society,* ser. A, v. 199, Nov. 7, 1949, p. 376-394.

Theory for the internal stresses caused by slip in crystalline materials is based on the concept of dislocations as they occur in the mathematical theory of elasticity, and on the work of Volterra. General formulas are derived for calculating stresses corresponding to given dislocations. Four examples involving plane and screw dislocations in circular cylinders are solved. Relations between mathematical dislocations and some simple types of slip in crystals.

4A-162. Iron-Nickel System; Further X-Ray Study of the Equilibrium Diagram. E. A. Owen. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 548-550; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4A-124, 1949.

4A-163. Microscopical Studies on Fe-Ni-Al System. Part I. $\alpha + \beta$ Alloys and Isothermal Sections of the Phase Equilibrium Diagram. A. J. Bradley. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 553-558; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4C-110, 1949.

4A-164. Fe-Ni-Cr Alloys; Constitution at 650° to 800° C. W. P. Rees, B. D. Burns, and A. J. Cook. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 559-564; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4A-123, 1949.

4A-165. Superestruturas de Estado Cristalino. (Superstructures of the Crystalline State.) Francisco F. Pereira Pinto. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 285-312.

Formation of superlattices was investigated theoretically and experimentally. For the latter, the alloys FeAl, Fe_3Al, and Cu_3Au were studied by X-ray diffraction. 18 ref.

4A-166. A Proposed Microbending Mechanism of Plastic Deformation. M. K. Yen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 1003-1004.

15 references.

4A-167. Trick Metals To Improve Steel. J. C. Feinberg. *Science News Letter,* v. 56, Dec. 10, 1949, p. 378-379.

Outlines work of Andrade on single crystals of metals. Peculiar mechanical and structural characteristics are explained on the basis of surface imperfections.

4A-168. Investigation of the Forms of Primary Crystallization in Metallic Alloys. (In Russian.) D. A. Petrov and A. A. Bukhanova. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), July-Aug. 1949, p. 396-408.

Dependence on temperature. A direct relationship between external form of crystals and their lattice structure was established. The formation of skeleton and dendrite forms is said to be related to the dissimilar surface energies of individual crystal elements (apex, ribs, and grains).

4B—Ferrous

4B-1. The Structure at a Cleavage Surface in Ferrite. E. P. Klier and others. *Metals Technology,* v. 15, Dec. 1948, TN 8, 2 pages.

Back-reflection X-ray patterns were obtained on the cleavage facets of ferrite grains. One of these is shown.

4B-2. Binary and Ternary Interstitial Alloys. I. The Iron-Nitrogen System: the Structures of Fe_4N and Fe_2N. II. The Iron-Carbon-Nitrogen System. III. The Iron-Carbon System: the Characterization of a New Iron Carbide. K. H. Jack. *Proceedings of the Royal Society,* ser. A, v. 195, Nov. 12, 1948, p. 34-61.

In Part I, the zeta phase of Fe_2N was prepared by passing NH_3 over iron at temperatures not over 450° C. Details of structure of the various phases involved were determined by X-ray diffraction. In Part II, chemical and X-ray investigation of the reaction of CO with iron nitrides and of that of NH_3 with iron carbides disclosed existence of iron carbonitrides, a series of new ternary interstitial alloys. In Part III, the cell dimensions of "iron percarbide," which has an empirical formula of $Fe_{20}C_9$, are given. This compound is believed to be the "Fe_2C" previously thought to exist. Cementite was also prepared—by action of CO on Fe_2O_3. Both carbides are metastable, forming alpha iron and carbon. 63 ref.

4B-3. A New Carbide in Chromium Steels. H. J. Goldschmidt. *Nature,* v. 162, Nov. 27, 1948, p. 855-856.

Discovery of a phase with crystal structure identical to austenite. Phase relationships believed to exist between this and other carbides are discussed from the theoretical point of view. Possible applications to practical metallurgy.

4B-4. Recherches sur le mécanisme de la fragilité de décapage de l'acier. III. Influence d'un recuit préalable dans l'hydrogene du fer Armco sur la diffusion ultérieure a froid de ce gaz dans le métal. (Research on the Mechanism of the "Pickling Brittleness" of Steel. III. The Influence of Preliminary Annealing of Armco Iron in Hydrogen on the Subsequent Diffusion of This Gas Into the Metal at Low Temperatures.) Paul Bastien. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 301-311.

Importance of hydrogen concentration in the gas layer adsorbed by iron and its release which causes brittleness. Experiments on monocrystals showed that the brittleness of the pickled monocrystals is not caused by absence of intercrystalline grain boundaries but by modification of the chemical activity of the metal itself, particularly of its surface.

4B-5. La fonte grise. Mécanisme de la solidification des fontes grises hypoeutectiques. (Gray Cast Iron. The Mechanism of Solodification of Hypoeutectic Gray Cast Iron.) (Concluded.) Henri Laplanche. *Fonderie,* Sept. 1948, p. 1299-1315.

Comparative investigation of the mechanism of solidification of synthetic alloys and the corresponding

industrial alloys revealed the influence of various factors on structure and properties. 47 ref.

4B-6. The Structure of Carbides in Alloy Steels. Part I. General Survey. H. J. Goldschmidt. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 345-362.

First of a series describing X-ray work especially on high speed steels. Mainly concerned with the structures of carbides formed by Fe, Cr, W, and Mo. Carbide structures are described and an attempt is made to correlate them with stability in the presence of given elements. 93 ref.

4B-7. Precision Measurement of Crystal-Lattice Parameters. D. E. Thomas. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 440-444.

Technique and effect of errors due to inaccurate measurement, penetration of the specimen, and divergence of the incident beam. Figures are given for the lattice parameter of iron.

4B-8. Belgian Research Advances Nodular Graphite Theory. Albert De Sy. *American Foundryman,* v. 15, Jan. 1949, p. 55-62.

1948 Exchange Paper of Belgian Foundrymen's Association to the French Foundrymen's Association advances the hypothesis that the crystal system of the nuclei or solid particles suspended in molten gray iron determines whether nodular graphite or flake graphite will be precipitated. Includes phase diagrams and photomicrographs.

4B-9. Certain Peculiarities of the Initial Stages of the Dissociation of the ε-Solid Solution in the Iron-Nitrogen System. (In Russian.) A. M. Elistratov. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1173-1178.

The effect of irregular diffusion of the Debye lines of the epsilon phase in the Fe-N system was investigated, establishing its relationship with dissociation of the supersaturated solution to a mixture of epsilon plus gamma phases. Proposes a theory explaining this phenomenon and compares results so obtained with experimental data.

4B-10. L'allotropie du fer et celle de l'helium. (The Allotropy of Iron and That of Helium.) Carl Benedicks. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 397-401.

The above was investigated for iron in the range 770-900° C. and for helium between 16 and 2.4° K. Fundamental similarities and differences of the two phenomena; a general mechanism for allotropy.

4B-11. Graphitisation in the Malleable Process. H. G. Hall. *Foundry Trade Journal,* v. 86, Jan. 20, 1949, p. 55-57. A condensation.

Fundamental reactions, the role of iron sulfide, factors affecting graphitization rate, effects of alloying and residual elements, and effects of raw materials. Application to production of malleable iron.

4B-12. A Description of Some Defects in Steel and Means for Their Detection. H. Thompson. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1751-1756.

The solidification process, typical types of defects, and methods for their detection. 10 ref.

4B-13. The Modifications of the Carbide, Fe_2C; Their Properties and Identification. L. J. E. Hofer, E. M. Cohn, and W. C. Peebles. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 189-195.

The relationship between Fe_2C carbides reported in thermomagnetic studies and those reported in X-ray diffraction studies. New results obtained with iron catalysts make possible a general unification of literature data. 20 ref.

4B-14. Homogeneous Yielding of Carburized and Nitrided Single Iron Crystals. A. N. Holden and J. H. Hollomon. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 179-185.

Method for preparation of the crystals and for their carburization, nitriding, and yield testing. Carbon or nitrogen causes discontinuous yielding in iron polycrystals but does not appear to cause discontinuous yielding in iron single crystals made from aluminum-killed steels. Both elements in small amounts cause an increase in the flow strengths of single crystals, but do not affect the rate of strain hardening. 10 ref.

4B-15. Lattice Spacing of Retained Austenite in Iron-Carbon Alloys. W. J. Wrazej. *Nature,* v. 163, Feb. 5, 1949, p. 212-213.

The author has previously suggested that the gamma solid solution in Fe-C alloys is composed of pseudo phases called γG, γS, and γE, the amounts of which depend on the carbon content of the particular alloy, thus making it possible to assume the existence of retained austenite in quenched alloys containing less than 0.6 but more than 0.444% C. Accurate measure-

ment by means of the combined-substance method confirms the continuous change of spacing of retained austenite. Its regularity enables determination of the carbon content of a particular alloy to be made on that basis.

4B-16. The Effect of Ferrite Grain Size on Notch Toughness. J. M. Hodge, R. D. Manning, and H. M. Reichhold. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 233-240.

First of a series of investigations of factors governing notch toughness in ferritic materials. Effect of ferrite grain size, and effect of 3.64% Ni.

4B-17. Recrystallization and Microstructure of Aluminum Killed Deep Drawing Steel. R. L. Rickett, S. H. Kalin, and J. T. Mackenzie, Jr. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 242-251.

Isothermal recrystallization of Al-killed steel of the elongated-grain type takes place in three rather distinct stages: an initial period resembling the start of recrystallization in rimmed steel; a second period during which recrystallization proceeds very slowly; and comparatively rapid recrystallization of the remaining unrecrystallized portion. Temperature variations may be used to change the recrystallization pattern.

4B-18. Precipitation Phenomena in the Solid Solutions of Nitrogen and Carbon in Alpha Iron Below the Eutectoid Temperature. L. J. Dijkstra. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 252-260.

Precipitation of carbon and nitrogen from solid solution in alpha-iron was studied at different tempering temperatures by internal-friction measurements. Measurements for nitrogen suggested the presence of two successive stages in precipitation. This suggestion was verified by metallographic examinations. 14 ref.

4B-19. Nodular Cast Iron. *Mechanical Engineering,* v. 71, Mar. 1949, p. 236-238. Based on article by J. G. Pearce, *British Information Services,* New York.

New type of cast iron made by adding a small amount of cerium, which causes the grains to form nodules instead of flakes, resulting in a product of greatly improved mechanical properties.

4B-20. Large Crystal Grain Size in Silicon-Chromium Valve Steel. C. C. Hodgson and H. G. Baron. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 81-85.

A coarse crystalline condition has been observed in valves and valve forgings made of Si-Cr steel. The influence of heat treatment on microstructure and experiments on plastic deformation. A satisfactory structure can result from widely differing mechanical operations and heat treatments, but certain combinations of these must be avoided if absence of critical grain growth is to be assured.

4B-21. A Constitution Diagram Applicable to Stainless Weld Metal. (In English, French, and German.) R. D. Thomas, Jr. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 15, Jan. 1949, p. 1-6; discussion, p. 12, 14-22 (English sections).

Use of the diagram in dealing with various weld-metal and base-metal compositions. The major application has been the prediction of weld-metal structures obtained on welding dissimilar metals.

4B-22. Reflections on Yielding and Aging of Mild Steel. (In English.) J. H. Palm. *Metalen,* v. 3, Jan. 1949, p. 97-106.

The phenomena of discontinuous yielding and strain-aging, as shown by conventional stress-strain curve. These phenomena cannot be attributed to precipitates in or around the ferrite crystals, but must both be due to carbon and nitrogen in solution in the lattice. Discontinuous yielding may be related to diffusion of C and N in the lattice during elastic straining. Strain aging, as far as the continuous part of the stress-strain curve is concerned, may be caused by migration of C and N to zones with imperfect lattices in which solubility is increased.

4B-23. Susceptibility to Graphitization of Modified Molybdenum Steel. J. A. MacMillan and G. V. Smith. *Welding Journal,* v. 28, Mar. 1949, p. 121s-125s.

Eight experimental heats containing 0.5 or 1% Mo and various amounts of Ti and Cb up to 1%, and two 1% Mo steels of commercial manufacture, all deoxidized with aluminum. Samples were normalized at 1650 or 2000° F. and bead welds laid down before exposing at 1025° F. for intervals totaling 10,000 hr. (1.1 year). The plain Mo steels graphitized to varying degrees whereas no graphite was observed in those containing Ti or Cb.

4B-24. A Note on the Effect of Internal Stresses on the Rates of Transformation in Iron-Nickel Alloys. C. C. Earley. *Institute of Metals,* Symposi-

um on Internal Stresses in Metals and Alloys, 1948, p. 233-236; discussion, p. 432-462.

During the gamma-alpha transformations on continuous rapid cooling of binary Fe-Ni alloys containing up to 27% Ni, the α-phase which forms has a distorted body-centered cubic structure. Variation in lattice strain with Ni content and its removal by suitable annealing treatment. Progress of the isothermal alpha-gamma transformations in strained and strain-free material.

4B-25. Internal Stresses and the Formation of Hair-Line Cracks in Steel. J. H. Andrew and Hsun Lee. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 265-273; discussion, p. 432-462.

Formation of hair-line cracks in steel is explained on the basis of internal pressures caused by hydrogen. It is suggested that molecular hydrogen could be located at the grain boundaries and that variation of the size of the mosaic blocks may account for the different way in which steels of different compositions and treatments respond to hair-line crack formation.

4B-26. Das veredelte Graphiteutektikum mit kugeligem, sphärolithischem Graphit. (The Improved Graphite Eutectic With Globular and Spheroidal Graphite.) Carl F. Adey. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Sept. 1948, p. 67-74.

Reviews recent literature on cast iron of spheroidal structure.

4B-27. Nodular Graphite in Cast Iron. H. W. Lownie, Jr. *Metals Review,* v. 22, Mar. 1949, p. 5-8.

Surveys major metallurgical development destined for important engineering and industrial uses. Literature references throughout the text.

4B-28. Fortschritte in der Isolierung von Einschlussen und Gefugebestandteilen in legierten und unlegierten Stählen. (Progress in the Separation of Inclusions and Structural Constituents in Alloyed and Unalloyed Steels.) Paul Klinger and Walter Koch. *Stahl und Eisen,* v. 68, Sept. 9, 1948, p. 321-332; discussion, p. 332-333.

A process of isolating oxide inclusions; the types of oxide formed under different deoxidation conditions. The behavior of oxides during working of the steel was investigated. 21 ref.

4B-29. Progress in Separation Methods. P. Klinger and W. Koch. *Engineers' Digest,* v. 10, Feb. 1949, p. 50. Translated and condensed from *Stahl und Eisen,* v. 68, Sept. 9, 1948, p. 321-333.

See abstract of original item 4B-28.

4B-30. Neue Beiträge zur Kenntnis der Karbide in legierten Stählen. (New Contributions to Knowledge of the Carbides in Alloy Steels.) Walter Koch and Hans-Joachim Wiester. *Stahl und Eisen,* v. 69, Feb. 3, 1949, p. 73-79.

Results of experiments made to isolate the carbides in Mo, Ni, and Si steels as well as those in "temper-tough" and "temper-brittle" steels. Effects of transformation in its various stages on the composition of carbides; results of an X-ray investigation of isolated carbides. 19 ref.

4B-31. Untersuchungen uber die Ursache der Anlassbeständigkeit sonderkarbidhaltiger Stähle. (Research on the Cause for the Retention of Hardness by Special Carbide-Containing Steels.) Walter Koch and Hans-Joachim Wiester. *Stahl und Eisen,* v. 69, Feb. 3, 1949, p. 80-86.

The study was made with two steels, one containing 0.3% C and 2.1% V; the other, 1-12% Cr. Hardness retention was found to be connected with a certain composition of carbon and alloy element. 13 ref.

4B-32. Austenitic Centers of Primary Crystallization in Steel. (In Russian.) V. E. Neimark. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1445-1449.

A method of determination of the dimensions of austenitic centers of primary crystallization, influence of factors such as melting point, rate of crystallization, and additions of Al, Mo, Zr, V, Ti, Cb, and B. Relation between above and secondary austenitic grain-size.

4B-33. Solubility of Hydrogen in Molten Iron and Its Alloys With Titanium, Columbium, and Tantalum. (In Russian.) M. M. Karnaukhov and A. N. Morozov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Dec. 1948, p. 1845-1855.

The solution of hydrogen in molten iron was investigated, including the influence of temperature and pressure on solubility and the kinetics of the process. The possibility of the formation of hydrides by alloy elements thus forming more stable compounds is considered.

4B-34. Inoculation et graphite des fontes grises. (Inoculation and Graphite of Gray Cast Iron.) Albert de Sy.

Fonderie, Jan. 1949, p. 1433-1444; discussion, p. 1444-1446.

Emphasis on the possibility of improvement of mechanical properties. The classical theory of superfusion and the dependence of the crystal structure of gray iron on this factor. Influence of other substances such as sulfur and phosphorus on properties and on distribution and form of the graphite.

4B-35. On Phase-Change Processes in Iron-Silicon Alloys. K. M. Guggenheimer and H. Heitler. *Transactions of the Faraday Society,* v. 45, Feb. 1949, p. 137-145.

Various phase-change processes in the solid state of the Fe-Si system which have been observed previously by measuring magnetic-saturation intensities as functions of temperature were studied with respect to their reaction kinetics. Quasi-monomolecular and bimolecular reactions were found and some activation energies determined.

4B-36. Beitrag zur Erforschung der schwarzen Stellen im Temperguss. (A Contribution to the Investigation of Black Spots in Malleable Iron.) Friedrich Vogel. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Feb. 1949, p. 45-47.

A chemical study indicates that black spots are undoubtedly a reaction product of the silica of the molding sand and the molten iron or aluminum, provided they are not slag inclusions.

4B-37. Die Karbide in Eisen-Kohlenstoff-Silizium-Legierungen und Gusseisen. (The Carbides in Iron-Carbon-Silicon Alloys and in Cast Iron.) Friedrich Bischof. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Feb. 1949, p. 51-52.

An experimental study of four different alloys. The greater instability of SiC over cementite in the annealed alloys.

4B-38. Wasserstoffgehalte flussigen Stahles verschiedener Herstellung. (Hydrogen Contents of Molten Steels Produced by Different Methods.) Hanns Wentrup, Herbert Fucke, and Otto Reif. *Stahl und Eisen,* v. 69, Feb. 17, 1949, p. 117-122.

The steels investigated were made in basic and acid openhearth furnaces and in the basic electric arc furnace. Method of sampling and analyzing the steels; the reasons for differences in the H-contents of different steels. The relation between flocculation number and hydrogen content. 16 ref.

4B-39. Effects of Various Deoxidizers on the Structures of Sulphide Inclusions. C. E. Sims, H. A. Saller, and F. W. Boulger. *American Foundrymen's Society,* Preprint 6, 1949, 15 pages.

Procedures followed and data obtained in a study of the effects of additions of 10 elements on inclusion characteristics. All of these elements have, or have been reputed to have, deoxidizing effects in steel.

4B-40. Note on As-Cast Structure and Grain Size in Cast Alloy Steels. Edward A. Loria. *American Foundrymen's Society,* Preprint 44, 1949, 8 pages.

New metallographic etching reagent for cast alloy steels shows as-cast austenite grain size in steels which do not show ferrite outlining of the original austenite grains. The number of as-cast grains in the central areas of etched cross sections for three steels were counted and average grain area compared with ASTM grain size developed at 1550 and 1700° F. It was found that there was no apparent relationship between the original and subsequent grain size.

4B-41. Grain Growth in Silicon-Chromium Valve Steel. H. Allsop and P. W. Bygate. *Journal of the Iron and Steel Institute,* v. 161, Apr. 1949, p. 318-325.

Severe grain growth occurs as a result of reheating critically strained material to sub-critical temperatures. The tendency to coarsen increases with increasing Si content, within the limits of B.S.En 52. The temperature necessary to effect refinement of coarsened material also increases with increasing Si and Cr. Effects of other factors.

4B-42. Mechanism of Solution of Carbides in Austenite. (In Russian.) V. I. Arkharov and S. T. Kiselev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 136-137.

Investigated by means of X-ray analysis. Results formerly obtained on high-alloy steel are confirmed for low-alloy steel.

4B-43. Zum Mechanismus der γ/α-Umwandlung des Eisens. (The Mechanism of the γ/α Transformation of Iron.) Helmut Neerfeld and Karl Mathieu. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 69-73.

The phase transformations of iron wire studied under tensile stress. Results indicate that the transformation mechanism depends on the external test conditions and the resulting stress conditions. 12 ref.

4B-44. Deformation Phenomena on a Cleavage Facet of Iron. C. A. Zapffe and C. O. Worden. *Metal Progress,* v. 55, May 1949, p. 640-641.

During a detailed fractographic study of iron, progressive changes in cleavage pattern were observed as the metal was plastically deformed. Three fractographs.

4B-45. Recrystallization and Grain Control in Ferrous Metals. R. L. Kenyon. *American Society for Metals,* "Grain Control in Industrial Metallurgy", 1949, p. 74-157.

Effect of deformation and subcritical annealing on ferrite grain size. Austenite grain-size control. 76 ref.

4B-46. Wechselbeanspruchung und Kristallzustand. (Alternating Stress and the Crystalline State.) Hermann Möller. *Stahl und Eisen,* v. 66-67, Dec. 4, 1947, p. 432-433.

Effect of alternating stress on the crystal structure of steel as revealed by X-ray diffraction.

4B-47. Gefugeeinfluss auf das Grenzschmierungsverhalten von Gusseisen. (Effect of Structure on the Boundary Lubrication Behavior of Cast Iron.) Johannes Kluge, Gerhard Bochmann, and Liselotte Fiddecke. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 139-142.

It was found that the structure of the graphite in cast iron has an important effect on the frictional properties of the metal. The reciprocal effect between the metal surface and the residual valences of the molecule of the lubricant is found to be of decisive importance.

4B-48. Einfluss des bainitischen Gefuges auf die mechanischen Eigenschaften eines warmfesten Cr-Mo-Vergutungsstahles. (The Effect of Bainite Structure on the Mechanical Properties of a Heat-Resistant Cr-Mo Temper-Hardening Steel.) U. Wyss. *Von Roll Mitteilungen,* v. 7, Dec. 1948, p. 51-70.

New observations on the above and on the creep limit at 500° C. Test method and results. 19 ref.

4B-49. Gases and Non-Metallics: First Collective Report of the B.I.S.R.A. Sub-Committee. Part I. Introduction. W. W. Stevenson. **Part II. Determination of Oxygen in Liquid Steel by the Aluminium-Killed Bomb Method.** G. E. Speight. **Part III. Determination of Hydrogen in Liquid Steel.** G. E. Speight and R. M. Cook. **Part IV. A Co-Operative Examination of a Manganese-Molybdenum Steel. Part V. A Co-Operative Examination of a Nickel-Chromium Steel. Part VI. A Co-Operative Examination of the Distribution of Non-Metallic Inclusions in Billets From a Mild-Steel Ingot.** T. E. Rooney. *Iron and Steel,* v. 22, May 12, 1949, p. 213-224; discussion, p. 268-269.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 10B-9, 1949.

4B-50. Si-Cr Valve Steel; Large Crystal Grain Size. C. C. Hodgson and H. G. Baron. *Iron and Steel,* v. 22, May 12, 1949, p. 225-228; discussion, p. 271.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 4B-20, 1949.

4B-51. Grain Growth; Occurrence in Silicon-Chromium Valve Steel. H. Allsop and P. W. Bygate. *Iron and Steel,* v. 22, May 12, 1949, p. 228-238; discussion, p. 271.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 4B-41, 1949.

4B-52. Alloy Steels; The Crystal Structure of Carbides. Part I. General Survey. H. J. Goldschmidt. *Iron and Steel,* v. 22, May 12, 1949, p. 239-246; discussion, p. 271-272.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 4B-6, 1949.

4B-53. Contribution a l'étude des relations entre la structure micrographique de l'acier et sa vitesse de fluage. (Contribution to the Study of the Relationship Between Micrographic Structure of Steel and Its Rate of Creep.) Georges Delbart and Michel Ravery. *Comptes Rendus,* v. 228, Mar. 28, 1949, p. 1025-1027.

Assuming that resistance to creep depends on chemical composition and crystal structure, the author attempts to show the influence of the form of the ferrite present on the rate of creep, mostly at low temperatures. Investigation was performed on low-carbon steel (0.12% C, 0.60% Cr, 0.60% Mo). heat treated differently to obtain the following structures: pearlite-ferrite, bainite-ferrite, sorbite-ferrite, bainite, and sorbite.

4B-54. Determination of the Chemical Composition of Iron Carbide in Steel. (In Russian.) N. M. Popova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 264-266.

Method based on preparation of a glycerin suspension of the carbides and subsequent dissociation by acids. The carbide residue, isolated from carbon steels by an electrolytic method, and dissociated in HCl, indicates that the composition

of iron carbide is independent of thermal treatment and corresponds to that of cementite.

4B-55. Petrographic and Chemical Characteristics of Nonmetallic Inclusions in Steel. (In Russian.) M. M. Shapiro. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 278-287.

A compilation of physical, chemical, and mineralogical properties of six main types of common inclusions. These data are obtained from the literature and from new work.

4B-56. Causes of the Existence of the Metastable System Iron-Cementite. (In Russian.) N. N. Sirota. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 697-700.

Problem was theoretically investigated. Results of calculation of energy formation of graphite and cementite nuclei indicate that the rate of formation of dimeric nuclei and, therefore, the linear rate of growth of cementite nuclei, at a given temperature, is considerably higher than that of graphite dimeric nuclei. This fact explains the presence of the metastable iron-cementite system simultaneously with the stable system iron-graphite.

4B-57. Somatoider Graphit im Grauguss. (Nodular Graphite in Gray Iron.) R. Bertschinger. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 15, Mar. 1949, p. 75-84.

Relationships between the various graphite forms, rate of cooling and the Fe-C-Si system; also factors affecting formation. The mechanical properties of gray irons containing nodular graphite.

4B-58. Untersuchungen an korrosionsbeständigem Stahlguss auf Chrom-Nickel-Basis unter besonderer Berucksichtigung der Sigma-Phase. (Research on Corrosion-Resistant Chromium-Nickel-Molybdenum Cast Steel With Emphasis on the Sigma Phase.) W. Felix and E. Eisermann. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 15, Mar. 1949, p. 84-92.

The effect of heat treating on formation of the sigma phase was investigated by examination of the structure and the mechanical and magnetic properties of the steel.

4B-59. Echter und unechter Stickstoffperlit. (True and Pseudo Nitrogen Pearlite.) Hermann Schottky. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 98-100.

A pearlite-like eutectoid (called braunite) of the Fe-N system formed from the gamma phase with 2.35% N at 590° C. 15 ref.

4B-60. Effect of Bainite on Properties. *Metal Progress,* v. 55, June 1949, p. 868, 870, 872. Translated and condensed from "Effect of Bainitic Structures on the Mechanical Properties of a Chromium-Molybdenum Steel," U. Wyss, *Von Roll Mitteilungen,* v. 7, Dec. 1948, p. 51-70.

Previously abstracted from original, item 4B-48, 1949.

4B-61. New Structural Diagrams for Alloy Cast Irons. H. Laplanche. *Metal Progress,* v. 55, June 1949, p. 839-840, 840B, 841.

Established on the basis of Si-C ratio, and the tendency of the carbide to be dissociated into graphite and ferrite during solidification. Numerical results for a series of pure cast irons.

4B-62. Pearlitic Structure Effect on Brittle Transition Temperature. Nicholas Grossman. *Welding Journal,* v. 28, June 1949, p. 265s-269s.

Tests on a plain, low-carbon-steel plate to determine effects of fineness of pearlite and grain size on the transition temperature of a specimen with a given geometry. Order and magnitude of the lowering of transition temperature from coarse to fine pearlite appeared to be about the same as that for the transition from large to small grains.

4B-63. Graphitization in the Malleable Iron Process. H. G. Hall. *Foundry,* v. 77, June 1949, p. 88-90, 212, 214, 216, 218, 220, 222, 224-225; July 1949, p. 92-95; 234-240.

Previously abstracted from condensed version in *Foundry Trade Journal.* See item 4B-11, 1949.

4B-64. Soft Magnetic Materials. E. A. Gaugler. *Product Engineering,* v. 20, July 1949, p. 84-89.

Composition, heat treatment, and properties of magnetic iron, silicon steel, Ni-Fe alloys, Fe-Co alloys, Fe-Ni-Co alloys, and the mixed ferrites.

4B-65. The Study of Grain Boundaries With the Electron Microscope. J. F. Radavich. *Journal of Metals,* v. 1, sec. 3, July 1949 *(Metals Transactions,* v. 185), p. 395-398.

Brittle steels were examined with an optical microscope to ascertain the nature and amount of impurities present. Due to the relatively low resolving power of the microscope, impurities are not visible in fine detail.

4B-66. Influence du chrome sur la

graphitisation des fontes blanches. (Influence of Chromium on Graphitization of White Cast Iron.) Gabriel Joly. *Fonderie,* Apr. 1949, p. 1537-1544.

Investigation on a white cast iron containing 2.16% C, 1.50% Si, 0.43% Mn, 0.09% S, and 0.13% P, with 10 different additions of Cr ranging from 0.032 to 0.137%.

4B-67. Effect of Composition on Low Carbon Austenitic Chromium-Nickel Stainless Steels. G. C. Kiefer and C. M. Sheridan. "Yearbook of the American Iron and Steel Institute, 1948", p. 476-499; discussion, p. 500-508.

Previously abstracted from *American Iron and Steel Institute,* preprint, item 3B-86, 1948.

4B-68. Het T.T.T.-diagram. (The T.T.T. Diagram.) F. van Wijk. *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Feb. 1949, p. 4-9.

Previously abstracted from *Metalen,* item 4b-92, 1948.

4B-69. Grain Size of High-Alloy Austenite as a Factor in Its Heat Resistance. (In Russian.) A. M. Borzdyka. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Mar.-Apr. 1949, p. 121-127.

The influence of grain size of ternary gamma solid solutions of the system Fe-Cr-Ni on their heat-resistant properties. The combined influence of the growth of the austenite grains and of dispersed-carbide formation during secondary heat treatment of solid solutions which are subjected to dispersed hardening (aging).

4B-70. Etude de la siliciuration des cathodes de fer par électrolyse des silicates alcalins fondus. (Study of "Silicification" of Iron Cathodes During the Electrolysis of Fused Alkaline Silicates.) M. P. Blum. *Verres et Réfractaires,* v. 3, Apr. 1949, p. 104-108.

Using a specially developed method, followed by X-ray diffraction investigation. Examination of such X-ray diffraction diagrams shows the presence of a series of definite compounds of iron and silicon: Fe_3Si, FeSi, and Fe_5Si_3. The Si content decreases progressively into the interior of the cathode. Its concentration on the surface of the cathode may reach 50%.

4B-71. Das Gefugebild des Meteoreisens. (The Structure of Meteoric Iron). H. Klemm. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 132-134.

The Widmannstätten structure, the Fe-Ni constitution diagram, and the extra-terrestial conditions that influence the microstructures of meteorites.

4B-72. Beitrag zur Kenntnis der Karbide in vanadinlegierten Schnellarbeitsstählen. (Carbides in Vanadium-Alloyed High-Speed Steels.) Helmut Krainer and Roland Mitsche. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 197-198.

After a brief survey of the literature, the lattice constants of the carbides in four steels alloyed with Cr, Mo, V, and W were determined. 13 ref.

4B-73. Interplanar Spacings of Carbides in Steels. H. J. Goldschmidt. *Metallurgia,* v. 40, June 1949, p. 103-104.

Using either extracted carbides or synthesized materials. For comparison, ferrite, austenite, and the sigma-phase, though not carbides, are also included. The radiation used was cobalt K_α throughout.

4B-74. Sur la pénétration de l'Hydrogene dans le Fer et quelques conséquences. (Concerning the Penetration of Hydrogen Into Iron and Some of Its Consequences.) M. E. Darmois. *Bulletin de la Société Chimique de France,* Mar-Apr. 1949, p. D170.

The literature on the above.

4B-75. State of α-iron in Annealed Martensite. (In Russian.) L. S. Moroz and Yu. S. Terminasov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 383-390.

Investigated by X-ray diffraction using specimens of carbon steel water quenched from 900° C. and annealed for different periods and at different temperatures. Method of experimental investigation. 12 ref.

4B-76. Periodicity of Deformation During Plastic Elongation and Contraction of Steel Having a Large Grain Size. (In Russian.) P. O. Pashkov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 391-398.

Distribution of local deformation as applied to plastic elongation and contraction of mild low-carbon and medium-carbon steel with large grain size.

4B-77. Recherches sur les variations de composition du protoxyde de Fer. (Research on Variations in the Composition of Ferrous Oxides.) Jacques Bénard. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D109-D116.

Problem was experimentally investigated in an attempt to establish the limits of existence of FeO between 570 and 1100° C. The point

of equilibrium between the phases Fe, FeO, and Fe_3O_4 is at 76.9% Fe at 580° C.

4B-78. Etude du procesus de décomposition du protoxyde de Fer. (Study of the Process of Decomposition of Ferrous Oxide). G. Chaudron and J. Bénard. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D117-D119.

The reaction $4FeO \rightarrow Fe_3O_4 + Fe$ was investigated between 300 and 570° C., in which range it is exclusively in the solid state. The method of thermomagnetic analysis was used.

4B-79. Formation and Expansion of Cracks in Hardened Steel Having a Heterophase Structure. (In Russian.) V. A. Pavlov and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 465-470.

The origin and propagation of cracks during bending of specimens having the following structures: martensite with a ferrite lattice along boundaries of former austenite grains; martensite with bainite; martensite with globular inclusions of ferrite, and an annealed martensite with cementite lattice. Causes of decrease of strength upon incomplete hardening of steel.

4B-80. Mechanism of the γ—α Transformation in Iron. J. Savage. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 77-81, 89.

Recent work of H. Neerfeld and K. Mathieu *(Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 69-73) and other pertinent literature on the subject. 11 ref.

4B-81. A Metallographic Description of Fracture in Impact Specimens of a Structural Steel. M. Baeyertz, W. F. Craig, Jr., and E. S. Bumps. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 481-490.

Attempts to establish a definite relationship between such words as "cleavage", "brittle", "shear", "ductile", "granular", "fibrous", and "silky" as used to describe the macroscopic appearance of fracture with corresponding microstructures. The fractures were made by impact testing of structural steel.

4B-82. Discontinuous Crack Propagation. L. D. Jaffe. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 526.

It has been generally believed that fracture originates at a point and, if the stress is sufficient, propagates across the material from this point. Evidence to the contrary is illustrated for a low-alloy steel. A theoretical explanation is offered.

4B-83. Mechanism of the Formation of Pearlite in Steels. Kotaro Honda. *Nature,* v. 164, Aug. 6, 1949, p. 229-230.

Simple explanation which assumes the boundaries of slip bands to be the seat of precipitation of cementite particles.

4B-84. Structure of Tempered Martensite. Jozef Mazur. *Nature,* v. 164, Aug. 6, 1949, p. 230-231.

Results of X-ray diffraction study of steels containing 0.89 and 1.2% C, previously subjected to very low-temperature treatment.

4B-85. Better Silicon Irons. T. Waterfall. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 82-83.

Research on the mechanism of nucleation and growth of metallic crystals to develop better silicon irons for the electrical industry.

4B-86. Zur Thermodynamik der Eisenlegierungen. (The Thermodynamics of Iron Alloys.) Willy Oelsen. *Stahl und Eisen,* v. 69, July 7, 1949, p. 468-475.

Calculating the equilibria of iron-rich alloys on the basis of simple thermodynamic data. This mathematical "synthesis" is based on the properties of the pure iron and thus permits revision of its heat-content curve. A series of explanatory examples are given, with special emphasis on such problems as the solubility of carbon in α-iron and of phosphorus in γ-iron as well as equilibria in the Fe-C system.

4B-87. Ueber den Ablauf der isothermen Austenitumwandlung eines Chrom-Magnetstahls sowie den Einfluss der Härtetemperatur und der Härtezeit. (The Course of the Isothermal Austenite Transformation of a Chromium Magnet Steel and the Effect of Hardening Temperature and of Hardening Time.) Werner Jellinghaus. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 243-248.

The rate of the isothermal transformation in a permanent-magnet steel was determined over the range −180 to 700°. Experimental procedure and data. 10 ref.

4B-88. Influence de l'hydrogène sur la cohésion de l'acier. (Influence of Hydrogen on the Cohesion of Steel.) Paul Bastien and Pierre Azou. *Comptes Rendus* (France), v 228, May 23, 1949, p. 1651-1653.

Investigated for annealed low-carbon steel between 15 and −160° C. In tensile testing an important factor indicating the influence of hydrogen content is the phenomenon of slip.

4B-89. The Mechanism of Martensite Formation. Alden B. Greninger and

Alexander R. Troiano. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions*, v. 185), p. 590-598.

Mechanism described is the outcome of two new experimental determinations: the accurate evaluation of the lattice relationship between austenite and individual crystals of martensite, and measurement and analysis of the change in position that a volume of austenite undergoes when it transforms into a crystal of martensite. For the latter, stereographic analysis of shear was employed. 18 ref.

4B-90. Grain Size of Martensite After Treatment at Very Low Temperature. Jozef Mazur. *Nature*, v. 164, Aug. 27, 1949, p. 358-359.

The grain size of austenite after different heat treatments was estimated from X-ray diffraction measurements. It was concluded that the grain sizes of martensite are not greatly different from those of the parent austenite.

4B-91. Atlas of Isothermal Transformation Diagrams. *Iron and Steel Institute* (London), Special Report No. 40, Mar. 1949, 63 pages.

Presentation includes explanatory text and micrographs.

4B-92. Relationship of Inclusion Content and Transverse Ductility of a Chromium-Nickel-Molybdenum Gun Steel. John Welchner and Walter G. Hildorf. *American Society for Metals*, Preprint No. 2, 1949, 19 pages.

Average rating per heat of steel versus reduction of area transverse. Both quantity and type of inclusions are considered for average as well as individual specimen comparisons. The manner in which the final product to be manufactured affects the results.

4B-93. The Effect of Vanadium and Carbon on the Constitution of High Speed Steel. Donald J. Blickwede, Morris Cohen, and George A. Roberts. *American Society for Metals*, Preprint No. 3, 1949, 32 pages.

Constitution of 6% W, 5% Mo, 4% Cr high speed steel was studied as a function of V, C, and temperature. The principal methods consisted of electrolytic extraction, chemical analysis, X-ray diffraction, and quantitative metallography. Limitations on range of potentially useful compositions are discussed. 21 ref.

4B-94. Measurement of Retained Austenite in Carbon Steels. B. L. Averbach, L. S. Castleman, and M. Cohen. *American Society for Metals*, Preprint No. 20, 1949, 10 pages.

An X-ray method previously applied to toolsteels was extended to low and medium-carbon steels. Measurable quantities of austenite were found in a series of quenched plain-carbon steels (both refrigerated and nonrefrigerated) containing 0.20-1.07% C.

4B-95. Fractographic Study of Deformation and Cleavage in Ingot Iron. C. A. Zapffe and C. O. Worden. *American Society for Metals*, Preprint No. 31, 1949, 27 pages.

Fracture facets of ingot iron were studied fractographically in a preliminary investigation of deformation and cleavage phenomena as expressed in cleavage patterns of iron. The patterns proved to be characteristic, reproducible, and informative, expressing features of original crystal growth, mechanical, thermal, and chemical treatment, and perhaps of recrystallization in annealed specimens. Effects of cold working and hydrogen embrittlement. Two new fractographic techniques. 20 ref.

4B-96. Electron Microscope Study of Quenched and Tempered Steel. J. Trotter and D. McLean. *Journal of the Iron and Steel Institute*, v. 163, Sept. 1949, p. 9-13.

Changes occurring during the tempering of a 0.6% C steel quenched to martensite were studied. Separate specimens were used for each tempering temperature and the series was examined with three different etching reagents. The electron microscope gave 5-10 times the resolution of the optical microscope. Observations are interpreted. 13 ref.

4B-97. An Investigation on Banding. J. D. Lavender and F. W. Jones. *Journal of the Iron and Steel Institute*, v. 163, Sept. 1949, p. 14-17.

Segregation in several steels was studied by microradiographic methods. Temperatures of the order of 1200-1350° C. were required to remove banding, in agreement with rough calculations based upon diffusion data. The relation between microradiographic and metallographic results.

4B-98. New Graphite Nodulizing Alloy Developed by Naval Research Laboratory. E. T. Myskowski and R. P. Dunphy. *Foundry*, v. 77, Oct. 1949, p. 72-75.

Experimental results in use of an Fe-Si-Mg alloy to produce nodular graphite in cast iron. It eliminates necessity for a separate inoculating treatment following the nodulizing addition.

4B-99. Size Effects in Quenching High-Purity, Precipitation Hardenable Alloys. Walter L. Finlay. *Journal of Metals*

(Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 668-674.

Size effects are believed to result from thermal fluctuations which occur in quenching a specimen of finite size into a cooling liquid rather than from the existence of a critical cooling rate. 17 ref.

4B-100. Discontinuous Crack Propagation. Further Studies. L. D. Jaffe, E. L. Reed, and H. C. Mann. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 683-687.

Impact test specimens, service fractures, and fatigue specimens of steel were observed. Results are discussed. 12 ref.

4B-101. The Free Energy Change Accompanying the Martensite Transformation in Steels. J. C. Fisher. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 688-690.

Influence of temperature and composition. 10 ref.

4B-102. Kinetics of the Austenite-Martensite Transformation. J. C. Fisher, J. H. Hollomon, and D. Turnbull. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 691-700.

Nucleation in single component systems, and in the two-component Fe-C system. M_s temperatures and transformation curves are calculated for several alloy steels of varying C and Cr content, and are compared with those determined experimentally by other authors. 28 ref.

4B-103. On the Problem of Grain Boundary Movement. C. G. Dunn, F. W. Daniels, and M. J. Bolton. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 708-709.

Observations on grain boundary movements in silicon iron indicated the possibility of studying grain growth phenomena in two-grain specimens. Technique which permits time-temperature investigation at constant curvature. Also, the rate of grain boundary movement can be measured as a function of temperature alone and results used to calculate activation energies.

4B-104. The Diffusion and Solubility of Carbon in Alpha Iron. James K. Stanley. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 752-761.

Reviews the literature. The Van Orstrand-Dewey method and the Grube method. 36 ref.

4B-105. Influence of Chromium on Graphitization of White Cast Iron. Gabriel Joly. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 66-70; discussion, p. 70-71.

Previously abstracted from *American Foundryman.* See item 4b-49, 1948.

4B-106. Production of Nodular Graphite Structures in Gray Cast Irons. H. Morrogh. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 72-87; discussion, p. 87-90.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4b-27, 1948.

4B-107. Nodular Cast Irons, Their Production and Properties. H. Morrogh and J. W. Grant. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A29-A51; discussion, p. A51-A53.

Previously abstracted from *Foundry Trade Journal.* See items 4b-54 and 3b-128, 1948.

4B-108. A Study of Residual Gases in Cast Iron. J. E. Hurst and R. V. Riley. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A54-A64; discussion, p. A64-A66.

Previously abstracted from *Foundry Trade Journal.* See item 4b-97, 1948.

4B-109. The Maurer Diagram and Its Evolution and a New Structural Diagram for Cast Iron. H. Laplanche. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A76-A93; discussion, p. A93-A94.

See abstract from *Metal Progress,* item 4-202, 1947.

4B-110. Carbides, Nitrides, and Carbonitrides of Iron. H. L. Riley. *Quarterly Reviews,* v. 3, no. 2, 1949, p. 160-172.

Crystal structure, phase transformations, and chemical reactions. 64 ref.

4B-111. Der Gefügetypus des Eisen-Kohlenstoff-Systems. (Structure Types in the Iron-Carbon System.) H. Klemm. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 265-271.

The metastable and stable structures of the Fe-C system normally occurring at room temperature and several typical structural phenomena, hardness structures, inclusions, and segregations. The Fe-C diagram and 22 photomicrographs.

4B-112. Effects of Stress and Deformation on the Martensite Transformation. Andrew W. McReynolds. *Journal*

of Applied Physics, v. 20, Oct. 1949, p. 896-907.

The relation between elastic and plastic strains and the martensite transformation from face-centered to body-centered structure was investigated in Fe-Ni 71-29 alloy. Results are contrary to expectations on the basis of the usual homogeneous-shear model for the transformation mechanism. They indicate that the martensite phase becomes thermodynamically stable at M_d but that transformation does not begin until M_s.

4B-113. Precipitation From Solid Solutions of C and N in α-Iron. Charles A. Wert. *Journal of Applied Physics,* v. 20, Oct. 1949, p. 943-949.

Formation of precipitates was studied by means of the internal-friction peak associated with stress-induced interstitial diffusion of solute atoms. A transformation law was found to fit the experimental data. Using results of a derivation, mean distance between nuclei is calculated for Fe_3C.

4B-114. Free Energy and Metastable States in the Iron-Nickel and Iron-Manganese Systems. F. W. Jones and W. I. Pumphrey. *Journal of the Iron and Steel Institute,* v. 163, Oct. 1949, p. 121-131.

A study was made of transformations in Fe-rich Fe-Ni and Fe-Mn alloys at heating and cooling rates of the order of 10° C. per min. Quantitative explanation is given by application of thermodynamic principles. 23 ref.

4B-115. Concerning the Critical Point of Toolsteel. II. Sorbite Phase. (In Japanese.) Masao Kondo and Yasuzi Mizunto. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 22-24.

The critical points of hypereutectoid steel (1.18% C, 0.23% Si, 0.28% Mn, 0.017% P, 0.023% S) were measured dilatometrically on quenching in oil after the following treatments: slow cooling (lamellar pearlite); annealing (globular pearlite); oil quenching (martensite); and air cooling (sorbite) from 950° C.

4B-116. X-Ray Line-Breadths of Martensite. *Nature,* v. 164, Oct. 22, 1949, p. 712-713.

Two communications. M. A. Jaswon comments briefly on some recent work by Józef Mazur. The latter replies, indicating complete agreement with the opinion of Wheeler and Jaswon that the main factor causing broadening of the lines is internal stress. 23 ref.

4B-117. Kinetics of the Primary Stage of Martensite Dissociation. (In Russian.) G. Kurdyumov and L. Lysak. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 525-531.

Relationship to time of annealing at temperatures of 80, 100, and 120° C. was investigated. Results confirm the "heterogeneous" character of the primary stage of martensite dissociation and indicate that rate of formation of carbide nuclei remains approximately constant until dissociation begins, after which it decreases.

4B-118. Carbide Phase During Annealing of Alloy Steel. (In Russian.) S. Z. Bokshtein. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 532-541.

Transformations which take place during annealing of Cr steel. 14 ref.

4B-119. Influence of Plastic Deformation in the Martensite-Transformation Region on Position of the Martensite Point. (In Russian.) V. I. Prosvirin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 542-549.

Steel containing 11.0% Cr, 3.85% Ni, and 0.34% C was studied. Attempts to explain the role of plastic deformation in the change of character of the martensite transformation on the basis of the results.

4B-120. Concerning Temperature Intervals in Lattice Transformations. (In Japanese.) Sakae Takeuchi and Hidezi Suzuki. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 26-29.

Fundamental principles. Assumes existence of a relationship between the free-energy change associated with phase transformation and the mechanical energy associated with plastic deformation. From this relationship, the dependence of amount of transformation on temperature was evaluated. Calculated values for the Fe-Ni alloy containing 20% Ni agree with experimental ones.

4B-121. Sur une nouvelle famille de sesquioxydes cubiques de fer stabilisés. (Concerning a New Family of Cubic Sesquioxides of Stabilized Iron.) A. Michel and E. Pouillard. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. 152.

Method of production by oxidation of substituted magnetites containing Al_2O_3. For percentages of less than 7% Al_2O_3, there is an increase in the temperature of destruction of the rhombohedral form, the final product being only slightly ferromagnetic. When a higher percentage of Al_2O_3 is present, temperatures up to 600° C. do not cause destruction of the cubic form.

4B-122. La graphitation. (Graphitization.) H. Brusset. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. D49-D52.

Investigated from the point of view of its mechanism and structural character. 20 ref.

4B-123. Vliv chemickeho slozeni na teplotu Ac_3 u podeutektoidnich oceli a volba kalici teploty. (The Influence of Chemical Composition on the Ac_3 Temperature of Hypo-Eutectoid Steels and Choice of Quenching Temperature.) Frantisek Sicha. *Hutnické Listy,* v. 4, June 1949, p. 169-175.

Use of dilatometric methods for study. On the basis of statistical analysis of test data, diagrams showing influence of C, Mn, Si, Ni, Cr, Mo, and V on Ac_3 temperatures were prepared. Unfavorable effect of higher quenching temperatures; optimum quenching and normalizing zones.

4B-124. Kinetics of Nitrogen Evolution From an Iron-Nitrogen Interstitial Alloy. Charles Goodeve and K. H. Jack. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 82-91; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 4b-86, 1948.

4B-125. Elimination of the Thermal-Diffusion Error in Studies of Gas-Metal Equilibrium. Minu N. Dastur and John Chipman. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 100-108; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 4b-85, 1948.

4B-126. Origin of Silicate Inclusions in Basic Electric-Arc-Furnace Steel of Higher Carbon Contents. Axel Hultgren. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 173-200.

Previously abstracted from *Metals Technology.* See item 4b-62, 1948.

4B-127. Effect of Hydrogen on the Ductility of Cast Steels. C. E. Sims, G. A. Moore, and D. W. Williams. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 283-308.

Previously abstracted from *Metals Technology.* See item 4b-94, 1948.

4B-128. Anisothermal Formation of Bainite and Pro-Eutectoid Constituents in Steels. Leonard D. Jaffe. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 363-376; discussion, p. 376-383.

Previously abstracted from *Metals Technology.* See item 18b-2, 1948.

4B-129. Austenite Transformation Above and Within the Martensite Range. R. T. Howard, Jr., and M. Cohen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 384-397; discussion, p. 397-400.

Previously abstracted from *Metals Technology.* See item 4-161, 1947.

4B-130. Diffusion of Carbon in Austenite With a Discontinuity in Composition. L. S. Darken. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 430-438.

Previously abstracted from *Metals Technology.* See item 4b-83, 1948.

4B-131. The Effect of Chromium on the M_s Point. J. B. Bassett and E. S. Rowland. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 439-446.

Previously abstracted from *Metals Technology.* See item 4b-61, 1948.

4B-132. The Structure at a Cleavage Surface in Ferrite. E. P. Klier, D. E. Nulk, and F. C. Wagner. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 707-708.

Previously abstracted from *Metals Technology.* See item 4B-1, 1949.

4B-133. Ingot Iron Inside Out. Carl A. Zapffe and C. O. Worden. *Metal Progress,* v. 56, Nov. 1949, p. 672-673.

"Obverse and reverse" patterns of a single cleavage traverse through an individual grain of ingot iron. Each view illustrates the cleavage pattern of hydrogen-embrittled iron. Numerous voids of sharply rectilinear outline are believed to be the micelles postulated by Zapffe in his new theory for the solid state.

4B-134. Austenite Transformation in the Hardenable Chromium Stainless Steels. (In English.) Paul S. Spencer and S. W. Poole. *Metalen,* v. 4, Sept. 1949, p. 1-9.

Effects of isothermal transformation on a series of stainless steels were determined by metallographic examination and hardness tests. Transformations were allowed to occur isothermally at temperature levels which would produce a soft ferrite-carbide type of structure and also at intermediate temperatures where little if any transformation occurs. Suggests practical application to the annealing of small forgings produced from AISI 410, 416, 420, and 440 types.

4B-135. Causes of Different Influences of Alloying Elements on the Eutectic

Point, Dissociation of Austenite, and on the Critical Rate of Tempering of Steel. (In Russian.) M. E. Blanter. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 109-112.

Proposes a series of equations relating different factors involved in the above problem. Analysis of these equations for different values of variables gives a clue for solution. Obtained theoretical data are in close agreement with results of experimental investigation.

4B-136. Fe-Ni and Fe-Mn Systems; Free Energy and Metastable States. F. W. Jones and W. I. Pumphrey. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 550-553; discussion, p. 603-605.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 4B-114, 1949.

4B-137. Constitution Diagram for Stainless Steel Weld Metal. Anton L. Schaeffler. *Metal Progress,* v. 56, Nov. 1949, p. 680, 680B.

The tentative constitution diagram has been revised to improve its accuracy in estimating the microstructure of a stainless-steel weld deposit on the basis of chemical composition. Microstructure of the more common types including those containing Mo and Cb.

4B-138. Vlocky v ocelich. (Flaking in Steels.) Frantisek Kinsky. *Hutnické Listy,* v. 4, July 1949, p. 201-210; Aug. 1949, p. 241-246; Sept. 1949, p. 277-284.

Theoretical and practical analysis of flaking caused by the presence of hydrogen, but affected by other factors. Recommendations for avoidance or minimization of flaking. 25 ref.

4B-139. Metallographic Technique for Steel: Etching Action of Nital and Picral. *Metal Progress,* v. 56, Dec. 1949, p. 832B.

Twelve photomicrographs show microstructures of different phases as revealed by these etchants.

4B-140. Note on As-Cast Structure and Grain Size in Cast Alloy Steels. Edward A. Loria. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 588-595; discussion, p. 595-596.

Previously abstracted from preprint. See item 4B-40, 1949.

4B-141. Effects of Various Deoxidizers on the Structures of Sulphide Inclusions. C. E. Sims, H. A. Saller, and F. W. Boulger. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 233-247; discussion, p. 247-248.

Previously abstracted from preprint. See item 4B-39, 1949.

4B-142. Activities of Carbon and Oxygen Dissolved in Liquid Iron. (In Russian.) A. M. Samarin and L. A. Shvartsman. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1231-1234.

Investigation shows that the thermodynamic behavior of carbon, dissolved in liquid iron, is similar to its behavior in austenite. Deviations from ideality in behavior of oxygen dissolved in liquid iron containing carbon are explained on the basis of the assumptions of Bachinskii concerning free space in a liquid.

4C—Nonferrous

4C-1. The Constitution of Tin-Rich Tin-Antimony-Copper Alloys. J. V. Harding and W. T. Pell-Walpole. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 115-130.

The constitution of the above alloys containing up to 14% Sb with 3% Cu was determined by thermal and microscopical analysis. Structures and applications of typical cast bearing alloys of this system are correlated with the features of the equilibrium diagram.

4C-2. Studies of Silicon Carbides With the Electron Microscope. E. DeHaas and D. Lundqvist. *Applied Scientific Research,* v. B1, No. 3, 1948, p. 181-186.

As an introduction to further investigations of the surface conditions of different types of silicon carbide, a number of green and black crystals were studied by the electron microscope.

4C-3. On the Structure of Gold-Silver-Copper Alloys. John G. McMullin and John T. Norton. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 46-48.

Emphasis is on the two-phase region in which Cu-poor and Ag-poor phases coexist.

4C-4. A Study of Textures and Earing Behavior of Cold-Rolled (87-89 Pct) and Annealed Copper Strips. Ming-Kao Yen. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 59-66.

Results of experiments on five types of commercial copper, made to evaluate effects of phosphorus and some other significant impurities on the development of texture during cold reductions. 21 ref.

4C-5. Use of Electrical Resistance Measurements to Determine the Solidus of the Lead-Tin System. Ralph

Hultgren. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 67-71.

Application of above technique, not hitherto reported in the literature. It was found to be convenient, reproducible, and highly sensitive. Compares results with those obtained by other methods by other investigators.

4C-6. Das Dreistoffsystem Gold-Kupfer-Nickel. II. Die Unwandlungen der Gold-Kupfer-Legierungen im Dreistoffsystem Gold-Kupfer-Nickel. (The Ternary System Gold-Copper-Nickel. II. Transformations of the Gold-Copper Alloys in the Ternary Gold-Copper-Nickel System.) Ernst Raub and Annemarie Engel. *Metallforschung,* v. 2, May, 1947, p. 147-158.

X-ray diffraction study of the above for AuCu-Ni and $AuCu_3$-Ni alloys with Ni contents up to 65.0 and 72.5%, respectively, after annealing at 300-400° C. Effects of cold working prior to annealing.

4C-7. Einkristalle des Monotektikums Zink-Blei. (Monocrystals of the Monoeutectic Zinc-Lead Alloy.) Wilhelm Hofmann. *Metallforschung,* v. 2, Dec. 1947, p. 383.

Shows experimentally that the frequently assumed fine-grain structure of the above refers to the dispersion of droplets, not to the simultaneously crystallized phase.

4C-8. Beitrag zur Kenntnis des Systems Zink-Chrom. (A Contribution to Knowledge Concerning the Zinc-Chromium System.) Theo Heumann. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 45-52.

Results of experiments made to determine the composition of the Zn-rich phase, its temperature of formation, and primary segregation curve; also the effect of temperature on the limit of solubility of Zn-rich solid solutions.

4C-9. Some New Ferromagnetic Manganese Alloys. F. A. Hames and D. S. Eppelsheimer. *Nature,* v. 162, Dec. 18, 1948, p. 968.

Preliminary experiments indicate that ferromagnetic phases exist in the binary systems Mn-Ge and Mn-In, and in the ternary system Cu-Mn-Ge. Investigation of these systems is being extended in order to identify the ferromagnetic carriers. It is suggested that ferromagnetic phases may exist in the Mn-Ga system.

4C-10. Magnetostriction and Order-Disorder. J. E. Goldman and R. Smoluchowski. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 140-147.

An experimental and theoretical study of the relationship between saturation magnetostriction and the order-disorder transformation in an Fe-Co alloy. Alloys in the neighborhood of 50 atomic % composition containing 0.75% Cr were used. Measurements of both electrical resistivity and neutron diffraction were used to confirm the presence of the superlattice. 13 ref.

4C-11. The Structure of Extremely Thin Layers Evaporated in Kinetic Vacuum Systems. H. A. Stahl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 1-8.

In a commercial electron-diffraction camera some alkaline earth metals were evaporated onto outgassed metal sheets or glass slides. The diffraction patterns of the thinnest layers (to about 10^3A) presented exclusively the patterns of the respective oxides. The pattern of the metal space lattice itself was increasingly observed with Be, Al, Ni, and Mo only after uninterrupted evaporation to layer thicknesses of about 1μ. When Mg, Ca, and Sr were evaporated, no patterns without very intensive oxide rings could be attained under the conditions used. 15 ref.

4C-12. The Thermal Behavior of Evaporated Layers in Vacuum Devices. H. A. Stahl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 8-14.

Some layers having the space lattice pattern of the metal (Be, Mg, Al, Mo, or Ni) were heated for constant periods. Beginning with a distinctly marked threshold temperature, interference rings of the oxide space lattice appeared while, simultaneously, the metal space-lattice pattern diminished, entirely disappearing at another higher temperature. The oxidation temperature ranges of Be, Mg, and Al were measured. An elementary calculation gives a lower time limit to oxidation of the observable surface layer. The surface layer of polished metals is considered. 28 ref.

4C-13. The Internal Friction of Zinc Single Crystals. Charles A. Wert. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 29-37.

Typical data for 12 single crystals of zinc oscillating longitudinally. Zinc of three grades of purity was used. The behavior of decrement as a function of stress-amplitude was found to depend less on purity of the metal than has been reported previously. Effects of cold-work and annealing variations.

4C-14. The Deformation and Recrystallization of an Alloy Containing Two

Phases. R. W. K. Honeycombe and W. Boas. *Australian Journal of Scientific Research,* ser. A, v. 1, no. 1, 1948, p. 70-84. (Reprint.)

An investigation on the above for an alloy of duplex brass containing 60% Cu and 40% Zn using microscopic and X-ray methods.

4C-15. Variation With Temperature of the Nucleation Rate of Supercooled Liquid Tin and Water Drops. Bernard Vonnegut. *Journal of Colloid Science,* v. 3, Dec. 1948, p. 563-569.

X-ray diffraction, dilatometric, and visual techniques for measuring the extent of crystallization of systems composed of many small mutually independent volumes of supercooled liquid. Results of preliminary measurements on supercooled liquid tin and supercooled water.

4C-16. Distribution of Electron Density in the Metallic Copper Lattice. (In Russian.) V. K. Kritskaya and B. M. Rovinskii. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 18, Sept. 1948, p. 785-789.

Possibility of applying Fourier series for quantitatively obtaining the above. Curves were obtained for three directions in metallic copper. It is shown that "computed temperature," introduced as a factor in the equation, may lead to considerable error in the final result.

4C-17. The Crystal Structure of CdSb and ZnSb. (In English.) Karl Erik Almin. *Acta Chemica Scandinavica,* v. 2, nos. 5-6, 1948, p. 400-407.

Lattice dimensions and structures were determined from powder and Weissenberg photographs.

4C-18. Uber die Struktur mechanisch bearbeiteter Oberflächen und deren Eigenschaften. (Zur Frage der sog. Beilby-Schicht.) (Concerning the Structures and Properties of Mechanically Worked Surfaces. The Question of the So-Called Beilby Layer.). H. Raether. *Zeitschrift fur Physik,* v. 124, Feb. 24, 1948, p. 286-308.

Investigations by electron-diffraction techniques. Interference pictures show the worked surfaces of silver and of inorganic insulating materials. Differences in behavior of metals and nonmetals on cold working. 59 ref.

4C-19. Beziehungen zwischen dem Elastizitätsmodul von Zweistofflegierungen und ihrem Aufbau. (Relationships Between Moduli of Elasticity and Structures of Binary Alloys.) Werner Köster and Walter Rauscher. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 111-120.

A comprehensive survey covering a variety of nonferrous continuous and limited solid-solution series, eutectic alloys, and alloys with intermetallic phases. 27 ref.

4C-20. Etude de la formation de l'ordre dans les solutions solides Or-Cuivre Au-Cu$_3$. (Study of the Disorder-Order Transformation in the Gold-Copper Solid Solution $AuCu_3$.) A. Guinier and R. Griffoul. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 387-396.

X-ray investigation in an attempt to explain the mechanism of the above type of transformations after heat treatment. 16 ref.

4C-21. Electronographic Study of Thin Films of Alloys of the Cu-Sn System. (In Russian.) G. A. Efendiev. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1159-1165.

Electronographic study of the alloy structure of the Cu-Sn system on film specimens obtained by vacuum deposition. Formation of delta, epsilon, and eta phases was shown to take place.

4C-22. Plasticity of Intermetallic Phases. (In Russian.) E. M. Savitskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Sept. 21, 1948, p. 349-351.

The characteristic properties of pure intermetallic phases were investigated for MgZn, $MgZn_2$, and $MgZn_5$ (more exactly, Mg_2Zn_{11}). Intermetallic phases, being very brittle at room temperature, show a marked increase of plasticity when heated. Because of the scarcity of existing data concerning the crystal structure at high temperatures, no definite conclusions concerning the mechanism of the temperature influence on plasticity were reached.

4C-23. Solubility Relationships of the Refractory Monocarbides. John T. Norton and A. L. Mowry. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 133-136.

Mixtures of monocarbides of Ti, Zr, V, Cb, and Ta were sintered in a conventional high-frequency vacuum furnace at 2100° C. for 3 hr. Equilibrium was judged by the appearance of the X-ray diffraction lines. Lattice constants were calculated from X-ray data.

4C-24. Properties of Chromium Boride and Sintered Chromium Boride. S. J. Sindeband. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 198-202.

Only one chromium boride exists between 12 and 20% B, instead of

two, as previously reported. This compound is said to be CrB. Structure, unit-cell dimensions, and coordinates. The pressing and sintering of CrB with a Ni binder, mechanical properties, and high-temperature strength and corrosion resistance. 13 ref.

4C-25. Grain Coarsening in Copper. Paul A. Beck, John Towers, Jr., and Philip R. Sperry. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 203-204.

Coarsening at 800° C., after 30-70% reduction by rolling, may develop in straight-rolled as well as in cross-rolled tough-pitch copper. This confirms the view that coarsening in Cu_2O-containing copper after 30-70% rolling is analogous to coarsening in aluminum containing dispersed particles of a second phase.

4C-26. Experimental Investigation of Electron Density in Crystals. III. Electron Density of Nickel. (In Russian.) N. V. Ageev and L. N. Guseva. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Sept.-Oct. 1948, p. 470-478.

Calculation of the distribution of electron densities for six directive elementary nuclei of nickel was performed by the method of the triple Fourier series at 8000° C. 15 ref.

4C-27. Internal Friction. Léon Guillet. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 116-119.

First results of a study of internal friction begun in 1943 using Chévenard's microtorsion test apparatus. Data for the solid-solution alloys Cu-Zn, Cu-Sn, and Cu-Al; the order-disorder transformations of Au-Cu alloys; and the contrasting behaviors of the gamma type, $Cu_{31}Sn_8$, and the beta type, CuZn, of intermetallic compound.

4C-28. Hardening of Metals by Internal Oxidation. J. L. Meijering. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 140-151.

Previously abstracted from *Philips Research Reports.* See item 4c-1, 1948. (See also item 18A-5, 1949.)

4C-29. On the Equations of Motion of Crystal Dislocations. F. C. Frank. *Proceedings of the Physical Society,* v. 62, sec. A, Feb. 1, 1949, p. 131-134.

A theoretical, mathematical analysis.

4C-30. The Brillouin Zones for the Co_2Al_9 and $NiAl_3$ Structures. G. V. Raynor and M. B. Waldron. *Philosophical Magazine,* ser. 7, v. 40, Feb. 1949, p. 198-205.

For the above phases, the most probable Brillouin Zones are characterized by inscribed spheres which can contain 2.12 and 2.00 electrons, respectively, per atom. These values are in close agreement with those calculated on the basis of the theory of the role of transitional metal solutes in Al-rich alloys. The results also support the view that the intermetallic binary and ternary compounds, formed by Al and transitional metals of the first long period, are electron compounds rather than compounds controlled mainly by electrochemical or atomic-size considerations.

4C-31. Recrystallization of Metals Under Stress. J. Neill Greenwood. *Nature,* v. 163, Feb. 12, 1949, p. 248-249.

Summarizes conclusions reached with respect to Pb and its dilute alloys as a result of 14 years of work.

4C-32. The Crystal Structure of Uranium Silicides and of $CeSi_2$, $NpSi_2$ and $PuSi_2$. W. H. Zachariasen. *U. S. Atomic Energy Commission,* AECD-2092, Jan. 6, 1948, 11 pages.

Structures of $CeSi_2$, USi_2, $NpSi_2$, $PuSi_2$, USi, U_3Si_2, and U_3Si. Interatomic distances.

4C-33. The Structures of Some Metal Compounds of Uranium. R. E. Rundle and A. S. Wilson. *U. S. Atomic Energy Commission,* AECD-2388, Nov. 10, 1948, 7 pages.

The compounds UAl_2, UAl_3, UAl_5, UHg_2, UHg_3, UHg_4, and USn_3 all have standard type structures except UHg_4 and UAl_5, which are quite complex.

4C-34. A Tentative Titanium-Nickel Diagram. J. R. Long, E. T. Hayes, D. C. Root, and C. E. Armantrout. *U. S. Bureau of Mines,* Report of Investigations No. 4463, Feb. 1949, 13 pages.

The general features of the diagram up to 40% Ni.

4C-35. The Structure and Properties of the Alloy Cu_2MnIn. B. R. Coles, W. Hume-Rothery, and H. P. Myers. *Proceedings of the Royal Society,* ser. A, v. 196, Feb. 22, 1949, p. 125-133.

The ferromagnetic Heusler alloy Cu_2MnAl has a body-centered cubic structure with an ordered arrangement of the atoms. It was suggested that if the Al were replaced by In, the superlattice would be more stable. Such an alloy was prepared and was ferromagnetic in the as-cast state, and also after a variety of heat treatments. Results

suggest that in the In alloy the critical value of R/r is being approached at which ferromagnetism will disappear. Reasons for supposing that the ferromagnetism is due to interaction between Mn atoms. 17 ref.

4C-36. Constitution of Sintered & Worked Titanium-Nickel Alloys. J. R. Long. *Metal Progress,* v. 55, Mar. 1949, p. 364-365.

Photomicrographs and tentative partial constitution diagrams.

4C-37. Superlattice Presence in Cu_3Au and FeCo Systems. Sidney Siegel and C. G. Shull. *U. S. Atomic Energy Commission,* AECD-2077, June 17, 1948, 3 pages.

Results of study using neutron diffraction.

4C-38. Investigation of Antimony-Cesium Layers by Means of an Electron Microscope. (In Russian.) A. I. Frimer. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 21, 1948, p. 255-257.

Technique for above investigation, characterized by the fact that the substance investigated can be kept under vacuum at all times. Several typical electron micrographs.

4C-39. X-Ray Investigation of the Structure of Nickel "Skeleton" Catalyst. (In Russian.) Yu. S. Terminasov and M. S. Beletskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Dec. 1, 1948, p. 411-413.

The residue remaining after leaching out the aluminum by means of a KOH solution from the compound Ni_2Al_3, that is, the nickel "skeleton" catalyst, represents dispersed crystals of nickel of hexagonal modification, in the crystal lattice of which is dissolved hydrogen.

4C-40. The Binary System Zirconium-Boron. (In English.) Roland Kiessling. *Acta Chemica Scandinavica,* v. 3, no. 1, 1949, p. 90-91.

Results of an X-ray study, giving unit-cell distances, lattice structures. Relationship with the Ti-B system.

4C-41. Untersuchungen an Zink-Sublimationskristallen. (Research on Zinc Sublimation Crystals.) D. Geist. *Acta Crystallographica,* v. 2, Mar. 1949, p. 13-14.

Zinc crystals grown by sublimation in air, in argon, or in vacuo were found to consist of stacks of plates parallel to the hexagonal basal plane. By direct microscopic and by interferometric measurement the thickness of these plates was shown to vary from 2μ down to less than 200 A.

4C-42. The Crystal Structure of Ni_4W. E. Epremian and D. Harker. *Journal of Metals,* v. 1, sec. 3, Apr. 1949, p. 267-273.

X-ray diffraction study of the beta phase. Photomicrographs in both quenched and aged conditions; hardness of the 19.8 atom % W alloy as a function of time and temperature of aging after quenching from 1150° C.; electrical resistivity data; and diffraction patterns.

4C-43. Der Einfluss des Silbers auf die Umwandlungen des Systems Gold-Kupfer. (The Effect of Silver on Transformations in the Gold-Copper System.) Ernst Raub. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 46-54.

Up to the saturation point of the ternary solid solution, silver greatly reduces the critical temperature of the AuCu transformation. The rate of transformation depends on the composition and state of the alloy as well as on its annealing temperature and previous mechanical treatment. Debye-Scherrer patterns.

4C-44. Mischkristallbildung in binären metallischen Legierungen. (Formation of Solid Solutions in Binary Metal Alloys.) Karl Löhberg. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 68-72.

The effect of the relative sizes of the different atoms; the importance of valence-electron concentration to the saturation concentration of the alpha solid solutions of several Cu and Ag alloys and to changes in the lattice dimensions of the alpha solid solutions of Mg and Zn alloys. 20 ref.

4C-45. Relation Between the Degree of Order and the Lattice Parameter of Cu_3Au. W. Betteridge. *Journal of the Institute of Metals;* v. 75, Mar. 1949, p. 559-570.

The lattice parameter was measured with the alloy in different degrees of short-distance order obtained by quenching from temperatures both above and below the critical temperature. The parameter is approximately linearly related to the degree of order. It is suggested that lattice parameters of solid solutions are better correlated with interatomic bond lengths than with atomic diameters, although bond lengths may vary with change in electron concentration. Parameters of the binary solid solutions of Cu, Ag, and Au were examined and bond lengths correlated with constitutional diagrams. 11 ref.

4C-46. The Primary Solid Solution of

Silver in Aluminium. G. V. Raynor and D. W. Wakeman. *Philosophical Magazine,* ser. 7, v. 40, Apr. 1949, p. 404-417.

The solid solubility curve was redetermined, using pure materials. In contrast to the reports of previous workers, the solubility curve is not smooth, but exhibits a marked change in direction in the region of 49.4% Ag at 526° C. Maximum solid solubility is 55.6% Ag at the eutectic temperature of 566° C. It is shown that the change in direction of the solubility curve occurs at the same electron:atom ratio as the peak of the $(\alpha + \alpha_1)$ miscibility gap in the Al-Zn system. Theoretical interpretation. 12 ref.

4C-47. The MBe_{13} Compounds. N. C. Baenziger and R. E. Rundle. *U. S. Atomic Energy Commission,* AECD-2506, Apr. 8, 1949, 4 pages.

A series of intermetallic compounds of composition MBe_{13} has been found, where M is U, Th, Ce, as Zr. Lattice constants and other structural parameters.

4C-48. A Calculation of the Solubility Limits of the Copper-Silver System. M. K. I. Arafa. *Proceedings of the Physical Society,* v. 62, sec. B, Apr. 1, 1949, p. 238-247.

Calculates change in the energy of a monovalent metal when one of its atoms is replaced by an atom of a different monovalent metal. From a knowledge of this energy, heat of solution can be determined and thereby, through the usual thermodynamic relations, solubility limits. Calculations show the existence of narrow solubility limits, in agreement with the known phase diagram. Theoretical values of heats of solution are compared with those required to give the observed solubility limits.

4C-49. Quasi-Chemical Theory of Order for the Copper Gold Alloy System. Yin-Yuan Li. *Journal of Chemical Physics,* v. 17, May 1949, p. 447-454.

Yang's general theory of superstructure is further generalized in terms of atomic distribution on sublattices of any number and of any geometrical arrangement. The possibility of the formation of different types of long-distance order due to the different recombinations of sublattices. The behavior of the Cu-Au system at very low temperatures and its phase diagram. Critical temperature, latent heat, curve of long-distance order, and energy vs. temperature for the CuAu tetragonal crystal. Results are quite different from those of Shockley's theory. 16 ref.

4C-50. The Structures of Uranium Metal. (In English.) A. S. Wilson and R. E. Rundle. *Acta Crystallographica,* v. 2, Apr. 1949, p. 126-127.

4C-51. X-Ray Powder Patterns of Boron Coated Mo and W. Filaments. St. v. Naray Szabo and Charles W. Tobias. *Journal of the American Chemical Society,* v. 71, May 1949, p. 1882-1883.

Method used for preparation of pure boron and boron tribromide and powder-pattern data.

4C-52. Recrystallization and Grain Size Control in Copper and Copper Alloys. Henry Burghoff. *American Society for Metals,* "Grain Control in Industrial Metallurgy", 1949, p. 158-208.

General properties as functions of grain size and effect of impurities on annealing. Commercial annealing practice. 38 ref.

4C-53. Die Legierungen des Zirkoniums mit Kupfer, Silber und Gold. (The Alloys of Zirconium With Copper, Silver, and Gold.) Ernst Raub and Max Engel. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 172-177.

Constitution diagrams are based on thermo-analytical, microscopic, and X-ray examinations. Mechanical and chemical properties of these alloys are discussed and compared with the corresponding alloys of thorium.

4C-54. Beitrag zum System Nickel-Mangan. (Research on the Nickel-Manganese System.) Werner Köster and Walter Rauscher. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 178-184.

System was re-examined by means of thermal analysis, by X-ray and microscopic methods, and by measuring magnetic properties and elastic behaviors. 14 ref.

4C-55. Das Dreistoffsystem Aluminium-Magnesium-Zinc. IV. Der Gleichgewichtsverlauf auf der Aluminium-Zink-Seite unterhalb 350°. (The Ternary Aluminum-Magnesium-Zinc System. IV. The Equilibrium Curve on the Al-Zn Side Below 350° C.) Werner Köster. *Zeitschrift fur Metallkunde,* v. 39, July 1948, p. 211-213.

Results of a study. The compositions studied contained 70-92.5% Zn.

4C-56. Mikroskopische und röntgenographische Untersuchungen zur Kenntnis des Systems Kupfer-Nickel-Aluminium. (Microscopic and X-Ray Investigations of the Copper-Nickel-Aluminum System.) Werner Köster, Ulrich Zwicker, and Kurt Moeller.

Zeitschrift fur Metallkunde, v. 39, Aug. 1948, p. 225-231.

Areas of primary crystallization and phase boundaries of the system at 500, 700, and 900° C. Equilibrium curves for the entire system. 10 ref.

4C-57. Microstructures of Silicon Ingots. W. G. Pfann and J. H. Scaff. *Journal of Metals*, v. 1, sec. 3, June 1949 (*Metal Transactions*, v. 185), p. 389-392.

Results of a microscopic investigation of structures of rapidly and slowly cooled ingots.

4C-58. Presence of Molecular Compounds in Fundamental Ternary Solid Solutions of Aluminum. (In Russian.) T. A. Badaeva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 1, 1949, p. 533-536.

An Al-Mg-Si alloy (containing 99 atom % Al) and an Al-Mg-Zn alloy were investigated, by determination of electrical resistances in the range 480-550° C. Results indicate the presence of Mg_2Si, $MgZn_2$ and $MgZn_5$, in the respective alloys.

4C-59. Constitution Diagram and Mechanical Properties of the System Mg-Zn. (In Russian.) E. M. Savitskii and V. V. Baron. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Feb. 11, 1949, p. 693-696.

Attempts to determine the cause of controversial data concerning the presence, in the system, of different intermetallic compounds such as MgZn, Mg_2Zn_3, $MgZn_2$, $MgZn_5$, and Mg_2Zn_{11}. Experimental results indicate that the cause is difference in conditions of heat treatment of the specimens. Presence of MgZn, $MgZn_2$, and $MgZn_5$ was established, but not Mg_2Zn_3 and Mg_2Zn_{11}. Influence of temperature on mechanical properties of the alloys.

4C-60. Effect of Neutron Bombardment on Order in the Alloy Cu_3Au. Sidney Siegel. *Physical Review*, ser. 2, v. 75, June 15, 1949, p. 1823-1824.

Samples in the ordered and disordered states were exposed in a nuclear reactor subject to an integrated fast-neutron flux up to 3.3 $\times$ 10^{-19} neutron per sq. cm. Electrical resistivity, and presumably the disorder, in the initially ordered samples increased, while little change was observed in the initially disordered samples.

4C-61. Effect of Neutron Bombardment on Order in the Alloy Cu_3Au. Sidney Siegel. *U. S. Atomic Energy Commission*, AECD-2465, Feb. 1, 1949, 2 pages.

4C-62. Sur les équilibres des systemes complexes riches en plomb contenant du zinc et d'autres éléments. (Equilibria of Complex Systems With High Lead Contents Containing Zinc and Other Elements.) Léon Jollivet. *Comptes Rendus* (France), v. 228, Mar. 28, 1949, p. 1128-1130.

Experimental investigation of several ternary systems. In particular, the Pb-As-Zn system was studied for the first time.

4C-63. Uber das System Zinn-Antimon-Schwefel. (The Tin-Antimony-Sulfur System.) Rudolf Vogel and Werner Gilde. *Zeitschrift fur Metallkunde*, v. 40, Apr. 1949, p. 121-126.

Results of thermal and microscopic investigations of the ternary system SbSn-SnS-Sb_2S_3, and of the binary system SnS-Sb_2S_3, showing that Sn has a greater affinity for S than has Sb. Constitution diagrams and photomicrographs.

4C-64. Ausdehnungsmessungen an binären Mischkristallen mit rucklaüfiger Löslichkeitskurve und an Metallen mit starken Gitterstörungen. (Expansion Measurements on Binary Solid Solutions Having Retrograde Solubility Curves and on Metals Having Large Lattice Distortions.) Ernst Raub and Karl Wolff. *Zeitschrift fur Metallkunde*, v. 40, Apr. 1949, p. 126-134.

Results of measurements on two Ag-Cu alloys containing 7 and 93% Cu, respectively; on Ag-Pb and Ag-Th alloys; and on silver electrodeposits containing nonmetallic inclusions. The results confirm the suitability of expansion measurements for investigation of normal segregation processes. Segregation of electrodeposited alloys is accompanied by large lattice distortions at low temperatures.

4C-65. Der Verlauf der Liquidus- und Soliduskurve im System Zink-Aluminium zwischen 30 und 70% Al. (Liquidus and Solidus Curves in the Zinc-Aluminum System Between 30 and 70% Al.) Erich Pelzel. *Zeitschrift fur Metallkunde*, v. 40, Apr. 1949, p. 134-136.

Determined by means of thermal analysis and quenching. Results are evaluated and compared with those of other authors.

4C-66. Gleichgewichtsuntersuchungen in den Systemen Zink-Aluminium und Zink-Aluminium-Kupfer. (Investigations of Equilibria in the Zinc-Aluminum and Zinc-Aluminum-Copper Systems.) Erich Gebhardt. *Zeitschrift fur Metallkunde*, v. 40, Apr. 1949, p. 136-140.

Deals with a wide range of Zn-Al

compositions and with the same compositions plus 1-3% Cu. Experimental methods. Results are compared with those obtained by other authors.

4C-67. Transformation of Gamma to Alpha Manganese. E. V. Potter, H. C. Lukens, and R. W. Huber. *Journal of Metals,* v. 1, sec. 3, July 1949 *(Metals Transactions,* v. 185), p. 399-404.

Changes in structure and resistivity of electrolytic Mn as it transformed from ductile gamma to brittle alpha Mn were determined. Transformation theory and transformation rates.

4C-68. Gefugebeobachtungen an Kupfer-Blei-Sinterwerkstoffen. (Observation of the Structures of Sintered Copper-Lead Materials.) G. Lichtenberg-Strunk and H. Wiemer. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 141-143.

The structures of Cu-Pb alloys containing 10-50% Pb and sintered in hydrogen at 300-700° C.

4C-69. Sur les équilibres des systemes riches en plomb contenant des métaux alcalins et alcalinoterreux. (Equilibria of Lead-Rich Systems Containing Alkali and Alkaline-Earth Metals.) Léon Jollivet. *Comptes Rendus,* v. 228, May 9, 1949, p. 1495-1497.

The systems Pb-Sb-Na, Pb-As-Na, Pb-Sb-Zn-Na, Pb-Bi-Mg-K, and Pb-Bi-Mg-Ca. Presence of equilibria between solid components not forming a solution with their constituents and the liquid phase where these components are completely dissolved.

4C-70. The X-Ray-Absorption Edges L_I of Tantalum and of Tungsten and L_{II} and L_{III} of Platinum. (In English.) D. Coster and H. De Lang. *Physica,* v. 15, May 1949, p. 351-357.

Experimental results.

4C-71. The System Silver-Magnesium-Tin, With Reference to the Theory of Ternary Alloys. G. V. Raynor and B. R. T. Frost. *Journal of the Institute of Metals,* v. 75, June 1949, p. 777-808.

Examined by microscopic and X-ray methods. Isothermals were established at 550 and 450° C. Results are plotted and discussed in terms of general alloy theory, and it is shown that electrochemical interaction between the solute atoms is of importance in governing general form and certain details of the equilibrium diagram. Influence of the effective size factor in the ternary system on the ranges of homogeneity of the 3/2 electron compounds. 24 ref.

4C-72. A Molybdenum Sigma Phase. H. J. Goldschmidt. *Research,* v. 2, July 1949, p. 343-344.

A compound, FeMo, which is stable only at high temperatures (1180-1540° C.) was found to possess the sigma structure, isomorphous with FeCr. Interplanar spacings of the two sigma phases.

4C-73. Allotropic Transformations in Titanium. A. D. McQuillan. *Nature,* v. 164, July 2, 1949, p. 24.

It has been reported that pure Ti prepared by the dissociation of titanium tetraiodide undergoes an allotropic change in the range 860-900° C. Careful examination indicates that there are two distinct transformations, one at 864 and another at 900° C., and that a third allotropic modification is stable between these temperatures.

4C-74. Concerning the High Pressure Allotropic Modification of Cerium. A. W. Lawson and Ting-Yuan Tang. *Physical Review,* ser. 2 v. 76, July 15, 1949, p. 301-302.

Reviews previous work. Investigation indicates that the high-pressure modification of the initially face-centered lattice stable at atmosphere pressure is also face-centered cubic. 10 ref.

4C-75. First Progress Report on Titanium-Carbon and Titanium-Nitrogen Phase Diagrams. J. P. Nielsen. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 153-157; discussion p. 157.

Objectives of research program at New York University. The diagrams are to be constructed from experimental data and will be confined only to the regions considered of practical interest for structural material, namely, from pure titanium to the compounds TiC, and TiN, respectively, and from the liquidus to about room temperature, the pressure being atmospheric. Preliminary phase diagrams estimated on the basis of the literature and theoretical considerations.

4C-76. Sur les deux mécanismes de transformation des solutions solides plomb-oxygene de teneurs limites $PbO_{1.33}$ et $PbO_{1.57}$. (Mechanism of Transformation of Lead-Oxygen Solid Solutions of Contents Between the Limits $PbO_{1.33}$ and $PbO_{1.57}$.) Théo Katz and René Faivre. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D124-D127.

Chemical and crystallographic investigation indicated the presence of a zone of homogeneous solid solutions in this range. These solid solutions may be reduced or oxidized

in a single phase, if the oxygen content does not exceed that corresponding to $PbO_{1.88}$. When this limit is exceeded, an irreversible two-phase reduction takes place. 15 ref.

4C-77. Precipitation dans les alliages. (Precipitation in Alloys.) A. Guinier. *Physica,* v. 15, Apr. 1949, p. 148-158; discussion, p. 158-160.

Treats structural aspects of transformation of a supersaturated solid solution to a mixture of equilibrium solution and crystals of the precipitated phase. An experimental investigation, using X-rays, of nuclei of supersaturated solid solutions during the first stage of aging. The alloys studied were those with spherical nuclei (Al-Cu, Al-Be), and those where the nuclei are not available for study (Al-Mg).

4C-78. Sites for the Free Valence Electrons in Metallic Alloys of the Gamma Brass Type. (In English.) A. J. Bradley. *Physica,* v. 15, Apr. 1949, p. 170-174.

Theoretical discussion.

4C-79. The Structures of Some Metal Compounds of Uranium. (In English.) R. E. Rundle and A. S. Wilson. *Acta Crystallographica,* v. 2, June 1949, p. 148-150.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2388, item 4C-33, 1949.

4C-80. Inverse Segregation in Non-Ferrous Alloys. W. T. Pell-Walpole. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 103-115.

Including some previously unpublished work on segregation of Sn and P in both "gassy" and degassed billets of phosphor-bronze which were cooled unidirectionally. An attempt is made to correlate the various conditions under which segregation may occur with the most probable theories as to cause and mechanism. 40 ref.

4C-81. Recovery and Recrystallization in Brass. B. L. Averbach. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 491-494.

On the basis of X-ray extinction measurements it is concluded that recovery may be a process analogous to recrystallization. It is possible that small strain-free grains are formed during recovery, and that recrystallization occurs when there is rapid growth in the size of these strain-free regions. 10 ref.

4C-82. Ferromagnetic Alloys in the Systems Cu-Mn-In and Cu-Mn-Ga. F. A. Hames and D. S. Eppelsheimer. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 495-499.

A ferromagnetic Cu-Mn-In alloy was prepared having an ordered body-centered cubic structure, probably structurally analogous to the ferromagnetic beta Cu-Mn-Al and Cu-Mn-Sn alloys. Ferromagnetic Cu-Mn-Ga alloys were also prepared. Properties and structure. 19 ref.

4C-83. Secondary Recrystallization in Copper. M. L. Kronberg and F. H. Wilson. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 501-514.

Develops a formal relationship between pairs of orientations from a study of orientations of large grains produced during "secondary recrystallization" of twin-bearing cubically aligned copper. Experimental evidence indicates that the large grains are formed by nucleation and growth of new orientations, with nucleation apparently initiating at twin boundaries. Two types of orientations were found. A possible mechanism of "secondary recrystallization". The need for a theoretical analysis. 19 ref.

4C-84. The Active Slip Systems in the Simple Axial Extension of Single Crystalline Alpha Brass. Robert Maddin, C. H. Mathewson, and W. R. Hibbard, Jr. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 527-534.

Suggests that plastic deformation in 70-30 alpha brass begins by gliding on octahedral planes possessing cross-slip folds. 12 ref.

4C-85. The Ordering Reaction in Co-Pt Alloys. J. B. Newkirk, A. H. Geisler, and D. L. Martin. *Journal of Applied Physics,* v. 20, Aug. 1949, p. 816.

In compositions of near 50-50 atomic %.

4C-86. Formation of Alloys from Evaporated Metals. H. J. Axon and G. A. Geach. *Research,* v. 2, Aug. 1949, p. 396.

X-ray and metallographic examination of several binary alloys prepared by evaporating two pure metals from separate molybdenum boats and condensing them simultaneously upon molybdenum foil at a temperature of 30-50° C.

4C-87. Note on a Particular Type of Cold Working of Grains of α Brass by Rolling. J. Schoofs. *Journal of the Institute of Metals,* v. 75, July 1949, p. 855-862.

Electro and etching procedure by which a new metallographic feature has been revealed in a certain number of crystals of an alpha brass that had received a particular annealing

and cold-working treatment. It consists of a series of bright, narrow bands across the grains. Two possible explanations of their formation.

4C-88. Aktivitäten im ternären flüssigen System Na-Cd-Hg. (Activities in the Ternary Liquid System Na-Cd-Hg.) H. Frauenschill and F. Halla. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie,* v. 53, May 1949, p. 144-151.

Determines, by measuring emf.'s and vapor pressures, activities of Na and Hg in the above system. Methods of experimentation and computation.

4C-89. Aktivitätsmessungen an flüssigen Natrium-Legierungen mit starken Abweichen von idealen Verhalten. (Activity Measurements in Molten Sodium Alloys Which Deviate Strongly From Ideal Behavior.) K. Hauffe and A. L. Vierk. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie,* v. 53, May 1949, p. 151-161.

Emf.'s of an electrochemical series of the type: liquid sodium-glass-liquid sodium alloy were determined. The study included the Na-Tl, Na-Sn, and Na-Pb systems. Activities and "RT ln f" values calculated from measured results are plotted for the respective alloys and compared with their respective constitution and energy diagrams. 48 ref.

4C-90. The Transformation of the β Phase of the Cu-Al System and the Effect of Mn Additions Upon It. II. The Tempering Process for Quenched β Alloys of the Cu-Al Binary System. Tempering of the β' Phase. III. Tempering Phenomena in Quenched β Alloys of the Cu-Al Binary System. Tempering of the γ' Structure. IV. The Effect of Mn Additions on the Tempering of β Aluminum Bronze. (In Japanese.) Isao Tarora. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 6-18.

Part II: the $\beta \rightarrow \beta_1 \rightarrow \beta'$ and reverse transformations were investigated by differential thermal analysis, measurement of change of specific electric resistance, differential dilatometry, measurement of hardness of tempered alloys, and X-ray analysis. The direct transformation takes place on quenching and the reverse on reheating of quenched alloys. Part III: transformations on heating quenched hypereutectoid alloys containing over 13.1% Al, their quenching, and effects on hardness. An acicular structure designated as γ' takes the place of the β mentioned in Part II. Part IV: effects of additions of 2-6% Mn on structure and hardness.

4C-91. Concerning the Change in Structure of Rolled Zinc Resulting From Mechanical and Electrolytic Polishing. (In Japanese.) Kyoichi Ikemura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 27-29.

Determined by X-ray diffraction.

4C-92. The Lattice Spacings of Substitutional Solid Solutions. G. V. Raynor. *Transactions of the Faraday Society,* v. 45, July 1949, p. 698-708.

The lattice spacings for solid solutions of various elements in Cu, Ag, and Au were analyzed in examination of the suggestion that change in lattice spacing on alloy formation may be considered in terms of an atomic size factor and a valency factor operating together. Results confirm the dual nature of lattice distortion effects in simple binary alloys. 17 ref.

4C-93. The Equilibrium Diagram of the System Lead-Tin. G. V. Raynor. *Institute of Metals,* Annotated Equilibrium Diagrams No. 6, Jan. 1947, 4 pages.

One of a series. 15 ref.

4C-94. The Equilibrium Diagram of the System Beryllium-Copper. G. V. Raynor. *Institute of Metals,* Annotated Equilibrium Diagrams No. 7, Feb. 1949, 5 pages.

One of a series. 12 ref.

4C-95. Experimental Investigation of Electron Density in Crystals. 4. Electron Density of NiAl. (In Russian.) N. V. Ageev and L. N. Guseva. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 225-233.

Structural factors for an alloy close to the NiAl composition were experimentally determined. Electron density is computed for six directions of the elementary nucleus of NiAl at a calculated temperature of 10,000° C. Bridges of increased electron density are observed between atoms of Ni-Al and Ni-Ni, indicating the presence of exchange forces between atoms. 12 ref.

4C-96. Composition of Alloys Present in the Constitution Diagram Between Fe and CoAl. (In Russian.) O. S. Ivanov and M. A. Skryabina. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 242-253.

On the basis of investigation of the energy states of solid solutions of Fe and FeSi, CoAl, and NiAl, the presence of a two-phase region between

Fe and CoAl at room temperature is assumed and confirmed experimentally. 12 ref.

4C-97. Sur la nature de la couche superficielle d'abrasion du laiton α. (Nature of the Superficial Layer on α Brass After Abrasion.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 228, May 23, 1949, p. 1653-1655.

Experimental investigation using a new method developed by the author indicates that the surface structure of mechanically polished brass consists of disarranged crystals caused by rupture of the solid-solution grains. The assumption of Dance and Norris, that the cause of this phenomenon is recrystallization of the deformed alloy under the influence of local heating, is considered to be erroneous.

4C-98. Das gerichtete Aufwachsen von Kupfer(1)-oxyd auf Kupfer-Einkristallkugeln. (The Oriented Growth of Cuprous Oxide on Spherical Copper Single Crystals.) Erich Menzel. *Zeitschrift für anorganische Chemie,* v. 256, Mar. 1948, p. 49-64.

The orientation of Cu_2O films on spherical monocrystals of copper was studied as a means of investigating physical and chemical phenomena on crystal surfaces, by optical and X-ray methods. 22 ref.

4C-99. Die γ-Mischkristalle im System Kobalt-Mangan. (γ-Solid Solutions in the Cobalt-Manganese System.) Armin Schneider and Wolfgang Wunderlich. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 260-263.

X-ray analyses of quenched Co-Mn alloys showed that below the solidus line the two metals form an interrupted series of solid solutions. A tentative Co-Mn constitution diagram is presented. 13 ref.

4C-100. Über die Überstrukturphasen im System Platin-Nickel. (Superstructural Phases in the Platinum-Nickel System.) Albrecht Kussmann and Helmut Ernst v. Steinwehr. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 263-266.

Proves radiographically the presence of an atomic order Ni_3Pt and explains the differences in the two superstructural phases Ni_3Pt and NiPt as regards kinetics of formation and properties.

4C-101. Der Aufbau galvanischer Legierungsniederschläge. VI. Die Kadmium-Zink-Legierungen. (The Structures of Galvanic Alloy Deposits. VI. The Cadmium-Zinc Alloys.) Ernst Raub and Bernhard Wullhorst. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 266-270.

The galvanic deposition of Cd-Zn alloys from cyanide and acid electrolytes, the relation between cathode potential, composition, and structure of the deposits, and the results of X-ray and microscopic investigation as well as hardness measurements.

4C-102. The Lattice Parameters of High Purity Alpha Titanium and the Effects of Oxygen and Nitrogen on Them. Howard T. Clark, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 588-589.

Within the last 20 years at least three sets of lattice constants for the room-temperature (alpha) phase of titanium have been reported that differ greatly. Presents new values. Effects of oxygen and nitrogen indicate that two of the previously reported values are probably in error because of the presence of one or both of these elements.

4C-103. Effect of Composition on the Wire Textures of Copper and Its Solid Solution Alloys. Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 598.

Results of experiments on Cu and its alloys with Al, Ni, and Zn, after being drawn to 86 and 96.4% total reduction in diameter.

4C-104. Structure and Nature of Kink Bands in Zinc. J. B. Hess and C. S. Barrett. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 599-606.

Formation of kink bands during compression of single-crystal rods of zinc occurs by progressive rotation of the lattice within the band, rather than by twin-like abrupt shear. Rotations from a few degrees to over 80° were measured. Results indicate that kink bands are deformation bands resulting from the ordinary crystal-slip process, not from a new mechanism of deformation.

4C-105. The Transformations in β-CuAl Alloys. E. P. Klier and S. M. Grymko. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 611-620.

Transformations for copper alloys containing 11.9 and 13.5% Al. Metallographic and X-ray results. 27 ref.

4C-106. Compression Textures of Copper and Its Binary Alpha Solid Solution Alloys. Walter R. Hibbard, Jr., and Delmar E. Trout, II. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 620.

Compression textures developed in copper alloys with Al, Ni, and Zn are shown to be essentially the same types as those reported by Barrett with compositional effects occurring

at approximately the same per cent additions as previously reported for rolled sheet and drawn wire.

4C-107. Annealing Twins in Copper and 70-30 Alpha Brass. Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 635-636.

70-30 alpha brass is shown to have greater tendencies toward annealing twin formation than copper. The twins-per-grain ratio is essentially constant for Cu and 70-30 alpha brass over a wide range of deformation temperatures and annealing temperatures, except for the alpha brass at 600° C.

4C-108. The Origin of Annealing Twins in Brass. Robert Maddin, C. H. Mathewson, and Walter R. Hibbard, Jr. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 655-663.

Single crystals of 70-30 α-brass were grown and homogenized. From these, tapered central sections were cut, etched to remove cold work, and electropolished. These crystals were extended at constant rate of loading and slip-line formation and position measured by X-ray methods.

4C-109. Some Observations on the Rate of Secondary Recrystallization in High Purity Copper. Anna M. Turkalo and David Turnbull. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 663-664.

Rate of the secondary transformation is much more rapid in high-purity copper than in OFHC copper. Effects of annealing at various temperatures after 90% reduction.

4C-110. Microscopical Studies on the Iron-Nickel-Aluminium System. Part I. $\alpha + \beta$ Alloys and Isothermal Sections of the Phase Equilibrium Diagram. A. J. Bradley. *Journal of the Iron and Steel Institute,* v. 163, Sept. 1949, p. 19-30.

Results of a thorough investigation of all alloys containing less than 50 atomic % Al, using quenched microsections, from 1350 to 750° C., at temperature intervals of 100° C. Photomicrographs and ternary diagrams. 19 ref.

4C-111. Étude par le polissage électrolytique et les rayons X de la structure cristalline de rubans ferromagnetiques. (Study by Means of Electropolishing and X-Rays, of the Crystal Structure of Ferromagnetic Strips.) Jean Wyart and Israel Epelboin. *Comptes Rendus* (France), v. 229, July 25, 1949, p. 301-303.

Variation with depth of the crystal structure of two compositions (17% Fe, 76% Ni, 5% Cu, 1.5% Cr; and 22% Fe, 76% Ni, 1.5% Mn), differently heat treated, was investigated. Electropolishing was used to remove uniform layers a few microns thick. Procedure and results.

4C-112. Concerning "Thermoelastic" Equilibrium During the Martensite Transformation. (In Russian.) A. V. Kurdyumov and L. G. Khandros. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 11, 1949, p. 211-214.

Results of experiments indicate two new phenomena in the martensite transformation: slow transformation at low temperatures and presence of "elastic" crystals in the martensite phase. The first phenomenon has already been established and explained. Experiments on a Cu alloy containing 14.5% Al and 1.5% Ni between 10 and 20° C. prove the existence of the second phenomenon.

4C-113. The Ternary System, Copper-Manganese-Zinc. T. R. Graham, J. R. Long, C. E. Armantrout, and A. H. Robertson. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 675-682.

Solid phase boundaries of the system from the Cu-Zn binary to the Mn-Zn binary for alloys containing up to 50% Zn. Alloys were examined by metallographic methods including hardness and X-ray data for confirmation. Includes micrographs and isothermal sections of the ternary system at various temperatures. 15 ref.

4C-114. Some Observations in the Structure of Alpha Brass Single Crystals After Cutting and Polishing. Robert Maddin and Walter R. Hibbard, Jr. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 700-701.

4C-115. Stages in the Deformation of Monel Metal as Shown by Polarized Light. D. H. Woodard. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 722-726.

Inhomogeneous plastic deformation, which results in lattice bending and development of deformation bands experienced by individual grains in polycrystalline monel, is revealed in the microstructure. 13 ref.

4C-116. Kinetics of the Reactions of Titanium With O_2, N_2, and H_2. Earl A. Gulbransen and Kenneth F. Andrew.

Journal of Metals (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 741-748.

Presents systematic study and correlates results with fundamental theories of gas-metal reactions. 48 ref.

4C-117. Structure of Diborides of Titanium, Zirconium, Columbium, Tantalum, and Vanadium. John T. Norton, H. Blumenthal, and S. J. Sindeband. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 749-751.

Preparation of samples and X-ray technique. Results of studies.

4C-118. Studies of Interface Energies in Some Aluminum and Copper Alloys. K. K. Ikeuye and Cyril Stanley Smith. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 762-768.

Experiments which show the effect of both composition and temperature on the dihedral angle and on the ratio of interphase and intercrystalline boundary energies for some alloys containing a liquid phase. Data on the rate of approach to the equilibrium angles in both solid and liquid phases.

4C-119. Effect of Small Quantities of Hydrogen and Grain-Size on the α-β Transformation of Titanium. A. D. McQuillan. *Nature,* v. 164, Sept. 24, 1949, p. 537.

4C-120. Reaktionen von Zink-Aluminium-Schmelzen mit festem Eisen. (Reactions of Zinc-Aluminum Melts With Solid Iron.) Erich Gebhardt and Irmgard Schmidt. *Zeitschrift für Metallkunde,* v. 39, Nov. 1948, p. 321-325.

The solubility of Armco iron in molten Zn-Al and Zn-Al-Cu alloys. The amounts of dissolved Fe were correlated with time of reaction and composition of the melts. Rates of reaction increased with Al content. Three different types of solvent attack. 14 ref.

4C-121. Das Dreistoffsystem Kupfer-Zink-Magnesium. (The Ternary Copper-Zinc-Magnesium System.) Werner Köster. *Zeitschrift für Metallkunde,* v. 39, Nov. 1948, p. 352-359.

Experimental results. Constitution diagrams and photomicrographs.

4C-122. Zur Kenntnis der dem Parkes-Verfahren zu Grunde liegenden Systeme. Die Systeme Blei-Zink sowie Wismut-Zink mit Silber und Kupfer. (Concerning Systems Based on the Parkes Process. The Lead-Zinc and Bismuth-Zinc Systems Containing Silver and Copper.) Ernst Henglein and Werner Köster. *Zeitschrift für Metallkunde,* v. 39, Dec. 1948, p. 391-400.

The Parkes process and experimentally determined equilibrium curves for the Pb-Ag-Zn, Pb-Cu-Zn, Bi-Ag-Zn, and Bi-Cu-Zn systems. Constitution diagrams of various related binary systems. 11 ref.

4C-123. Crystal Orientation in Magnetic Alloys. Martin Littmann. *Electrical Engineering,* v. 68, Nov. 1949, p. 977-979.

For many magnetic alloys, permeability is strongly dependent on crystal orientation. 3% Si and 48% Ni irons are described in which the cube edges of the crystals are aligned with the rolling direction of the sheet, thus permitting utilization of superior permeability in that direction.

4C-124. Détermination magnétique de la constitution d'alliages paramagnétiques. Application aux alliages Cérium-Magnésium. (Magnetic Method for Determination of the Constitution of Paramagnetic Alloys. Application to Cerium-Magnesium Alloys.) Francoise Mahn. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 7, 1948, p. 145-155.

Investigation indicates that the alloys possess paramagnetism according to Weiss's law in almost the entire composition range. Constitutional diagrams of Vogel and of Haughton and Schofield are revised on the basis of the results. 23 ref.

4C-125. Influence de la répartition des imperfections de structure des cristaux de solution solide aluminium-cuivre sur le mode de précipitation de la phase θ'. (Influence of the Distribution of Structural Imperfections in the Crystal Structure of an Al-Cu Solid Solution on the Precipitation of the θ' Phase.) Paul Lacombe and Aurel Berghezan. *Comptes Rendus* (France), v. 229, Aug. 1, 1949, p. 365-367.

Castaing and Guinier have already shown, by electron-microscope study, the concentration of dissolved atoms in the intergranular region. Variation of distribution of the θ' phase with time of quenching and method of recrystallization is shown by optical microscopy.

4C-126. Contributo allo studio della morfologia delle inclusioni non metalliche nei prodotti siderurgici. Inclusioni nei ferro-cromi. (Contribution to the Study of the Morphology of Nonmetallic Inclusions in Metallurgical Products. Inclusions in Ferrochromium.) Raffaello Zoja. *La Metallurgia*

Italiana, v. 41, Mar.-Apr. 1949, p. 80-94.

Inclusions in 96 specimens were examined for frequency of occurrence, size, etc., of the various types. Alpha and beta-type silicates represented about 80% of the total. Methods of investigation.

4C-127. Beitrag zur Frage der umgekehrten Blockseigerung bei Aluminium-Kupfer-Magnesium-Legierungen. (Contributions to the Problem of Inverse Ingot Segregation in Aluminum-Copper-Magnesium Alloys.) Hugo Vosskühler. *Zeitschrift für Metallkunde*, v. 40, Aug. 1949, p. 305-311.

Various theories on segregation. Contrary to earlier assumptions of a uniform Cu content across the ingot, the Cu content of an Al-Cu-Mg alloy ingot shows considerable variations not explained by prevailing theories.

4C-128. Über die röntgenographische Untersuchung schmelzflüssiger Metalle und Legierungen. (The X-Ray Investigation of Molten Metals and Alloys.) II. F. Sauerwald. *Zeitschrift für anorganische Chemie*, v. 257, Nov. 1948, p. 195-198.

Data for molten Hg, Pb, Sn, Tl, and Hg-Pb and Hg-Tl alloys. Different results by different authors point to the possibility of differences in the liquid structures of a given metal or alloy due to differences in melting conditions. 11 ref.

4C-129. Über die Oxydation von Silber-Kupfer-Legierungen. (The Oxidation of Silver-Copper Alloys.) Ernst Justus Kohlmeyer and Karin V. Sprenger. *Zeitschrift für anorganische Chemie*, v. 257, Nov. 1948, p. 199-214.

Proves experimentally that molten Ag-Cu alloys containing up to at least 30% Ag can be completely oxidized at 1230° C. If the alloy contains more than 30% Ag, the oxidized melt will contain unoxidized Ag in addition to Ag_2O and Cu_2O. The same results are obtained by heating an Ag_2O-CuO mixture to 1230° C. At atmospheric pressure, molten Cu_2O will dissolve up to 44 weight % Ag_2O. Includes constitution diagrams. 18 ref.

4C-130. The Binary System Chromium-Boron. I. Phase Analysis and Structure of the ζ and θ-phases. (In English.) *Acta Chemica Scandinavica*, v. 3, no. 6, 1949, p. 595-602.

The system was investigated by X-ray methods. Five intermediate phases with B contents of about 33 atomic % (δ), 40% (ϵ), 50% (ζ), 55% (η), and 66.7% (θ) were found to exist. Complete structure determinations of the orthorhombic ζ-phase and the hexagonal θ-phase were carried out. 13 ref.

4C-131. The Borides of Tantalum. (In English.) Roland Kiessling. *Acta Chemica Scandinavica*, v. 3, no. 6, 1949, p. 603-615.

The Ta-B system was studied by X-ray methods. Four intermediary phases exist. Complete structure determinations of each of the phases. 13 ref.

4C-132. On Two Modifications of Nickel Oxide. (In English.) Yasumitsu Shimomura and Zenji Nishiyama. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 2-3.

Experimental results indicate that NiO has a rhombohedral structure. The cubic modification was also found to exist in some cases. Includes microphotometer curves of diffraction lines obtained on heating the oxide.

4C-133. A Note on the Nature of Superlattice Formation in Fe-Al Alloys. (In Japanese.) Hiroski Sato. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 3-8.

Results of investigation indicate that anomalous physical properties observed in Fe-Al alloys are due to interrelations between superlattice formation and the origin of spontaneous magnetization.

4C-134. Concerning "Anomalous" Temperatures of Cu and Their Relationships. (In Japanese.) Mituru Sato and Tosiro Suzuoka. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 19-22

Analysis of literature data resulted in fixing of 230, 277, 550, and 1083° C. as "anomalous" temperatures at which there is a marked shift in the curves of temperature vs. different mechanical and physical properties.

4C-135. The Metallography of Copper Containing Small Amounts of Bismuth. L. E. Samuels. *Journal of the Institute of Metals*, v. 76, Sept. 1949, p. 91-102.

The dark lines noted at the grain boundaries of electropolished specimens of brittle Bi-containing copper are not films, as previously supposed, but step-like grooves. Deep-etched grooves are also developed at the grain boundaries of both mechanically and electropolished specimens by a number of etching reagents. A mechanism of embrittlement based on one previously advanced for temper-brittleness of steels is suggested. 12 ref.

4C-136. Das Zustandsbild Nickel-Thorium. (The Nickel-Thorium Constitution Diagram.) Lore Horn and Christl

Bassermann. *Zeitschrift für Metallkunde,* v. 39, Sept. 1948, p. 272-275.

Investigated by thermal analysis, metallographic and X-ray examinations, and microhardness measurements.

4C-137. Oberflächenwanderung von Wolfram auf dem eigenen Kristallgitter. (Surface Migration of Tungsten on Its Own Crystal Lattice.) Erwin W. Müller. *Zeitschrift für Physik,* v. 126, Aug. 30, 1949, p. 642-665.

Method of determining the number of mobile atoms on the surface at elevated temperatures, based on the fact that submicroscopic tungsten tips increase, on heating, their radius of curvature which can be measured by their field emission. The nature and shape of the heated tip was investigated and the expected current density and directional dispersion of field emission calculated. 29 ref.

4C-138. Microstructural Investigation of Kinetics of the Martensite Transformation in Copper-Tin Alloys. (In Russian.) G. V. Kurdyumov and L. G. Khandros. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, July 1949, p. 761-768.

Investigated for alloys containing 24-25% Sn. Photomicrographs show phase transformations under different conditions.

4C-139. Investigation of Diffusion of Zinc in α-Brass in the Temperature Region 400-750° C. (In Russian.) S. Gertsriken, I. Dekhtyar, and L. Kumok. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, July 1949, p. 769-772.

The study revealed a point of inflection in the curve of temperature vs. diffusion coefficient near 450° C. Energy and entropy of activation for both branches of this curve were determined. Anomalous behavior is explained by the influence of internal local deformations in the lattice.

4C-140. Thermodynamics of Lead-Zinc Alloys. John Lumsden. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 60-68; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions,* Preprint. See item 3c-85, 1948.

4C-141. Plastic Deformation of Large Grained Copper Specimens. W. R. Hibbard, Jr. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 52-72.

Previously abstracted from *Metals Technology.* See item 4c-73, 1948.

4C-142. Some Factors Affecting the Rate of Grain Growth in Metals. J. E. Burke. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 73-91.

Previously abstracted from *Metals Technology.* See item 4c-78, 1948.

4C-143. The Kappa Eutectoid Transformation in the Copper-Silicon System. W. R. Hibbard, Jr. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 92-100.

Previously abstracted from *Metals Technology.* See item 4c-72, 1948.

4C-144. Mechanism of Precipitation in a Permanent Magnet Alloy. A. H. Geisler and J. B. Newkirk. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 101-120.

Previously abstracted from *Metals Technology.* See item 4c-60, 1948.

4C-145. The Cobalt-Chromium Binary System. A. R. Elsea, A. B. Westerman, and G. K. Manning. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 579-602.

Previously abstracted from *Metals Technology.* See item 4c-42, 1948.

4C-146. Platinum-Tungsten Alloys. R. I. Jaffee and H. P. Nielsen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 603-615.

Previously abstracted from *Metals Technology.* See item 4c-58, 1948.

4C-147. Fractographic Study of Cast Molybdenum. C. A. Zapffe, F. K. Landgraf, and C. O. Worden. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 616-636.

Previously abstracted from *Metals Technology.* See item 4c-59, 1948.

4C-148. Microstructure of Uranium. H. P. Roth. *Metal Progress,* v. 56, Nov. 1949, p. 662-663.

Six micros show structures as rolled at 500° C.; extruded and annealed (three variations); rolled and annealed (two variations).

4C-149. Electron Micrographs of Tungsten. Laurence Delisle. *Metal Progress,* v. 56, Nov. 1949, p. 670-671.

A particle of tungsten powder, sections from annealed and as-drawn wire, and grain boundaries in tungsten rod.

4C-150. The Effect of Cold Work in Metals on Powder Pattern Intensities. B. L. Averbach and B. E. Warren. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1066-1069.

Using crystal monochromated Cu Kα-radiation and a Geiger counter spectrometer, integrated intensity measurements were made for powder

samples of cold-worked and annealed α-brass. Measurements were made of the (400) reflection of cold-worked samples and of an annealed sample held at high temperature to demonstrate the difference between effects of cold work and temperature vibration.

4C-151. Inverse Segregation in Non-Ferrous Alloys. Part II. W. T. Pell-Walpole. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 171-182; advertising section, p. 52.

Major theories of mechanism and causes are reviewed in the light of known facts concerning this phenomenon. 58 ref.

4C-152. La recristallisation isotherme. (Isothermal Recrystallization.) P. Laurent, M. Eudier, and M. Batisse. *Revue de Métallurgie,* v. 46, July 1949, p. 446-451; discussion, p. 451-452.

Theoretically investigated for aluminum (99.4%) and brass. Theories of Krapkowski and Balicki, Cook and Richards, Johnson and Wehl, and Burgers.

4C-153. Zur Konstitution der Wismut-Antimon-Legierungen. (The Constitution Diagram of Bismuth-Antimony Alloys.) Georg Masing, Paul Rahlfs, and Werner Schaarwächter. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 333-334.

Resistance measurements made to determine the melting point of homogenized specimens indicate a correction of the Bi-Sb diagram by raising the solidus curve to slightly higher temperatures.

4C-154. Mangan-Silber, Mangan-Gold. (Manganese-Silver, Manganese-Gold.) E. Raub. *Zeitschrift für Metallkunde,* v. 40, Sept. 1949, p. 359-360.

Constitution diagrams plus brief description.

4C-155. Influence of Small Additions of Antimony on the Frontal Diffusion of Silver Into Polycrystalline Copper. (In Russian.) V. I. Arkharov and T. Yu. Gol'dshtein. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 21, 1949, p. 1113-1115.

4C-156. Recrystallization of Single Crystals After Plastic Bending. R. W. Cahn. *Journal of the Institute of Metals,* v. 76, Oct. 1949, p. 121-143.

Experiments to find out how to produce in deformed crystals a special type of recrystallization which leads to discontinuous asterisms in the Laue patterns. Bent single crystals are particularly liable to this type of recrystallization, which has been observed with Zn, Mg, Al, and rock-salt. Systematic experiments with Zn crystals established an optimum bending radius, annealing time, and annealing temperature. Microstructures of bent and of annealed specimens, and theory of the phenomenon. 36 ref.

4C-157. The Equilibrium Diagram of the System Chromium-Manganese. S. J. Carlile, J. W. Christian, and W. Hume-Rothery. *Journal of the Institute of Metals,* v. 76, Oct. 1949, p. 169-194.

Determined for the whole range of compositions above 1000° C. and for the range 60-100 atomic % Mn at lower temperatures. 12 ref.

4C-158. A Note on the Effect of Nitrogen on the Structures of Certain Alloys of Chromium and Manganese, and on the Existence of an Intermediate Nitride Phase. S. J. Carlile and W. Hume-Rothery. *Journal of the Institute of Metals,* v. 76, Oct. 1949, p. 195-200.

When alloys were annealed above 1000° C. in mullite tubes filled with argon, a new nitride phase was formed. Photomicrographs show growth of this nitride phase and its development of acicular structures. An X-ray diffraction photograph suggests that the phase is a new substance, possibly of the formula $(CrMn)_3N$.

4C-159. Étude dilatométrique de la transformation ordre ⇄ désordre dans les ferronickels voisins de Ni_3Fe. (Dilatometric Study of the Order-Disorder and Reverse Transformations in Ferronickels Close to the Composition Ni_3Fe.) Emile Josso. *Comptes Rendus* (France), v. 229, Sept. 19, 1949, p. 594-596.

Data on a series of specimens containing 70-80% Ni.

4C-160. La détermination de la phase Co^7Mo^6. (Determination of the Phase Co_7Mo_6). E. Henglein and H. Kohsok. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 569-571.

X-ray diagrams and table, comparing calculated and observed intensities in the powder pattern of the above phase. Results prove the existence of this phase, and its crystal dimensions are given.

4C-161. Variation of Boundary Solubility of Solid Metals Under the Influence of Multilateral Compression. (In Russian.) M. I. Zakharov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 69-71.

The concentration of solid solution in equilibrium under compression changes slowly over periods from 2 hr. up to several days. Rate of at-

tainment of equilibrium varies with temperature. Data for Zn in Cu, Al in Cu, and Cu in Al.

4C-162. Investigation of the Mn-Ni System. (In Russian.) N. N. Kurnakov and M. Ya. Troneva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 1, 1949, p. 73-76.

Investigated by means of dilatometric studies and changes in electrical resistance, particularly the solid-state transformation in the Mn-rich zone. 18 ref.

4C-163. The Effect of Working and Heating Eutectic Structures. J. S. Brown and A. G. Guy. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), p. 933.

Results for the Pb-Mg eutectic containing 33.2% Mg, showing conditions as cast, after 70% compression, and after heating the compressed specimen 1 hr. at 850° F. Similar results obtained with other eutectics indicate that eutectic structures can be recrystallized into a "spheroidized" condition by heating near the eutectic temperature after severe deformation.

4C-164. Investigation of the Structure of Fe-CoAl-NiAl Alloys. (In Russian.) O. S. Ivanov and M. S. Skryabina. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimischeskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), July-Aug. 1949, p. 337-342.

Data presented are of value in the study of highly coercive alloys. Difference in influence of Al on ferromagnetism of the solid solution in the absence and in the presence of Co and Ni. This difference is explained by the presence of "molecules" of CoAl and NiAl inside the ternary and quaternary solid solutions. Method of investigation.

4C-165. Note on the Structure of Uranium. (In English.) Joseph S. Lukesh. *Acta Crystallographica,* v. 2, Dec. 1949, p. 420.

Lattice-dimension data of other investigators for the alpha form were confirmed by use of single crystals.

4D—Light Metals

4D-1. Hydrogen in Aluminum. Yves Dardel. *Metals Technology,* v. 15, Dec. 1948, TP 2484, 14 pages.

New method for determining the amount of hydrogen in liquid as well as in solid aluminum, based on bubble formation on lowering of the hydrostatic pressure above the melt. The method was also applied to a study of degassing methods and of the effect of dissolved hydrogen on properties. 20 ref.

4D-2. Magnesium Alloy Castings. N. Nicholas. *Research,* v. 1, Dec. 1948, p. 718-719.

Methods for improving mechanical properties. Method in which high-frequency current causes a predetermined reduction of grain-size and directional orientation of crystals with corresponding improvement in properties.

4D-3. Intergranular Corrosion of Pure Aluminium in Relation to the Behavior of Grain-Boundaries During Melting. G. Chaudron, P. Lacombe, and N. Yannaquis. *Nature,* v. 162, Nov. 27, 1948, p. 854-855. Translated from the French.

Chalmers showed that the grain boundaries of high-purity tin have a melting temperature lower than that of bulk tin. A similar effect was observed in the case of high-purity aluminum by use of a simple device. When the metal was heated for a long time near its melting point, an inversion of the corrosion was observed; for example, HCl only dissolved the bulk of the crystals, leaving their boundaries uncorroded, as a very thin partition.

4D-4. The Constitution of Aluminium-Manganese-Magnesium and Aluminium-Manganese-Silver Alloys, With Special Reference to Ternary-Compound Formation. D. W. Wakeman and G. V. Raynor. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 131-150.

In connection with the role of transitional metal solutes in Al-rich alloys, experimental studies of the above systems were made. Results from the theoretical point of view. 27 ref.

4D-5. Les imperfections de structure des cristaux uniques d'aluminium pur. (Imperfections in Pure Aluminum Monocrystals.) P. Lacombe and L. Beaujard. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 317-322.

Results indicate the presence of intercrystalline lines on the above, produced by recrystallization in the solid state. These lines form boundaries of small blocks, slightly disoriented, disclosed by etching and shown by photomicrographs of low magnification. The aluminum crystals do not always exhibit the phenomenon of "veining." 16 ref.

4D-6. Etude de la recristallisation de l'aluminium de haute pureté par traitements de recuit isothermes. (Study of

Recrystallization of High Purity Aluminum Caused by Isothermal Annealing.) Henri Chossat, Paul Lacombe, and Georges Chaudron. *Comptes Rendus* (France), v. 227, Sept. 20, 1948, p. 593-595.

The above was investigated at temperatures of 206, 245, and 285° C. The beginning of recrystallization occurs at 20° and its end at 285° C. The relationship of the mechanical properties of pure aluminum (99.99%) to time of annealing was established for this temperature.

4D-7. Uber die Löslichkeit von Eisen, Mangan und Zirkon in Magnesium und Magnesiumlegierungen. (Concerning the Solubilities of Iron, Manganese, and Zirconium in Magnesium and Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 22-27.

Results of determination of the above. Photomicrographs show crystal formation in the melts. 10 ref.

4D-8. Bemerkung zu einer Arbeit von G. Bassi: "Einfluss einer thermischen Vorbehandlung auf die Korngrosse von ausgehärteten Blechen einer Legierung der Gattung Al-Cu-Mg nach kritischer Verformung." (Remarks on Work by G. Bassi: "Effect of Thermal Pretreatment on the Grain Size of Hardened Sheets of an Al-Cu-Mg Alloy After Critical Deformation.") Karl Ludwig Dreyer. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 27-28.

Bassi showed that coarse-grained recrystallization of an Al-Cu-Mg alloy can be avoided by suitable annealing after the homogenizing treatment. Dreyer shows experimentally that grain growth can be avoided by grain-boundary segregation, but that this effect will be absent when the metal is annealed at 500° C. before critical deformation.

4D-9. Some Experiments on the Reaction of Titanium With Oxygen and Nitrogen. L. G. Carpenter and F. R. Reavell. *Metallurgia,* v. 39, Dec. 1948, p. 63-65.

Exploratory experiments on the reaction at 700 and 1000° C., using the two gases in separate experiments under pressures corresponding to their partial pressures in air. Probabilities of reaction, under these conditions of temperature and pressure, are calculated.

4D-10. Grain Refinement in Cast Aluminum. Vincent DePierre and Harold Bernstein. *Iron Age,* v. 163, Jan. 20, 1949, p. 66-70.

The influence of various elements upon crystallization characteristics. Effects of elements reported to be grain refiners, those which form commercial alloys, and those classed as impurities in commercial aluminum.

4D-11. The Recovery and Recrystallization of Rolled Aluminium of Commercial Purity. P. C. Varley. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 185-202.

A study was made, by means of ultimate tensile strength determinations, of the above process within the range 200-325° C. The observations are consistent with the theory that both recovery and recrystallization take place by the diffusion of dislocations in the lattice and the mutual annihilation of those of opposite sign.

4D-12. Experiments on the Possibility of Hardening the Alpha Solid Solution of Selected Binary Magnesium Alloys by the Addition of 1% of Rare Earth Metals. H. T. Hall. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 3-28.

Structures and properties of alloys obtained by addition of 1% rare-earth metals to the following magnesium alloys: 8% Al; 6% Sn; 6% Ag; 6% Zn + 0.4% Mn; and 4% Zn + 0.4% Mn. The effects of increased rare-earth contents, silver additions, and various heat treatments were determined and sagging tests at elevated temperatures were carried out. Solution and fully heat treated properties of Mg + 8% Cd + 1% rare-earth; and 3% Zn + 2% Cd + 1% rare-earth alloys also were determined.

4D-13. Uber den Einfluss pendelnder Gluhtemperaturen auf Einformungs- und Diffusionsvorgänge in Aluminium-Legierungen. (The Effect of Fluctuating Annealing Temperatures on the Shape and Diffusion of Inclusions in Aluminum Alloys.) H. Kostron. *Metall,* June 1948, p. 179-185.

Proposes a theory to explain the fact that diffused metal (for instance, silicon) segregates in the form of bars, scales, or needles rather than as spheres or spheroids. Photomicrographs show the inclusions in Al-Cu-Mg alloys. 12 ref.

4D-14. Evolution structurale des alliages trempés Aluminium-Cuivre 4% et la réversion. (Structural changes of an Annealed 4% Copper Aluminum Alloy and Its Reversibility.) Adrian Saulnier. *Revue le l'Aluminium,* v. 25, Dec. 1948, p. 369-373.

It was found that recrystallization takes place after the end of the structural-hardening stage, resulting in a secondary increase of hardness.

4D-15. Uber die Weiterentwicklung von Magnesiumlegierungen. (The Further Development of Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde,* v. 39, April 1948, p. 97-105.

The effect of Be on the oxidizability of molten Mg alloys; the grain-refining effect of Zr and Ce on cast and forged materials; and the effect of chlorine as well as organic and inorganic chlorine and carbon compounds on the grain size of cast Mg-Al and Mg-Zn alloys.

4D-16. Preferred Orientation in Rolled and Recrystallized Beryllium. A. Smigelskas and C. S. Barrett. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 145-148.

X-ray pole figures were determined for samples rolled at room and at elevated temperatures. Typical series included exposures with the beam normal to the rolling direction and at 11, 26, 41, 56, and 71° to the cross direction, plus two exposures with the beam normal to the cross direction, and at 11 and 79° respectively to the rolling direction.

4D-17. Preferred Orientation in Rolled and Recrystallized Beryllium. A. Smigelskas and C. S. Barrett. *U. S. Atomic Energy Commission,* AECD-2063, May, 1948, 8 pages.

Previously abstracted from *Journal of Metals.* See item 4D-16, 1949.

4D-18. Study of Slip in Aluminium Crystals by Electron Microscope and Electron Diffraction Methods. R. D. Heidenreich and W. Shockley. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 57-75.

Electron microscope results indicate that the slip band is a laminar region resulting from a stepwise slip process. Electron diffraction results indicate that relative rotation of adjacent laminas about the normal to the slip plane occurs as well as simple translation. Electron-diffraction Kikuchi lines are sensitive to crystal imperfections associated with plastic deformation. Hardening produced in surface layers by intermittent stress applications is due to a higher concentration of imperfections in these layers. 22 ref.

4D-19. "Sub-Boundary" and Boundary Structures in High Purity Aluminium. A. Sub-Boundary Structure. P. Lacombe and L. Beaujard. **B. Boundary Structure.** P. Lacombe and N. Yannaquis. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 91-94.

"Macromosaic structure" has much greater dimensions than "micromosaic" and occurs when large single-metal crystals are prepared either by solidification from the melt or by annealing after critical deformation. Study shows veining or line structure representing boundaries between blocks of slightly differing orientation. The behavior of the grain boundaries of high-purity Al on attack by HCl supports the hypothesis of transition structure. 13 ref.

4D-20. Effect of Recrystallization Texture on Grain Growth. Paul A. Beck and Philip R. Sperry. *Journal of Metals,* v. 1, sec. 3, Mar. 1949, p. 240-241.

Very large grain size was developed in high-purity aluminum by growth at 650° C. in specimens 0.200 in. thick. These specimens were then rolled to 75% reduction in thickness. After annealing and re-etching, each area corresponding to a single grain before annealing was found to consist of a multitude of new grains with well-developed preferred orientation. Annealing was found to have little grain-growth effect on the well-oriented grains.

4D-21. The Coefficients of Expansion of Some Solid Solutions in Aluminium. W. Hume-Rothery and T. H. Boultbee. *Philosophical Magazine,* ser. 7, v. 40, Jan. 1949, p. 71-80.

The solid solution has a greater coefficient of expansion than the pure metal. In aluminum alloys, formation of the solid solution is accompanied by an expansion of the lattice. It was suggested that solid solutions might show increased or decreased coefficients of expansion when lattice distortion was respectively an expansion or a contraction. Carefully controlled X-ray methods used. Results show that the coefficient of expansion of Al is increased by solution of elements which produce both expansion (Mg) and contraction (Zn, Li) of the lattice of the solvent.

4D-22. Influence de la vitesse d'échauffement sur la grosseur des grains de l'aluminium de pureté 99.5% laminé et recuit. (Influence of Rate of Heating on the Grain Size of 99.5% Pure Rolled and Annealed Aluminum.) J. Hérenguel and F. Santini. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 468-474; discussion, p. 474.

Influence of rate of heating during annealing and of other conditions of heat treatment on grain size and mechanical characteristics of an aluminum alloy of the Mg-Si type and of 99.5% pure Al.

4D-23. Note on the Effect of Cold

Work on the Rate of Precipitation in Aluminum-7% Magnesium and Aluminium-8% Magnesium-1% Zinc Alloys. E. C. W. Perryman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 251-254; discussion, p. 432-462.

Overstrain prior to low-temperature heat treatment of above homogenized alloys has a marked effect on precipitation of the second phase at temperatures up to 200° C. Such overstrain causes the Mg_2Al_3 to form more continuous grain boundary networks and the stress-corrosion life of the 7% Mg alloy is found to be greatly affected, particularly by the first 1 or 2% of overstrain.

4D-24. Non-Metallic Inclusions in Magnesium-Base Alloys and the Flux-Refining Process. E. F. Emley. *Journal of the Institute of Metals,* v. 75, Feb. 1949, p. 431-480.

An investigation into behavior of inclusions in molten metal and the nature and function of the refining process. Physical properties of flux and ways of obtaining desirable properties and avoiding defects. Methods for detecting inclusions and for determining their origin by chemical, microscopic, and spectroscopic means. 28 ref.

4D-25. Non-Metallic Inclusions in Magnesium-Base Alloys Containing Zirconium. E. F. Emley. *Journal of the Institute of Metals,* v. 75, Feb. 1949, p. 481-512.

Origin and behavior of these inclusions. Early work leading to the recognition of new types of chloride inclusions associated with zirconium-rich particles.

4D-26. Equilibrium Diagrams of Aluminum Alloys. W. L. Fink. *American Society for Metals,* "Physical Metallurgy of Aluminum Alloys," 1949, p. 1-92.

Methods by which these diagrams have been determined. Some of the diagrams which have been determined with sufficient accuracy and with sufficient completeness to justify consideration; and their interpretation. 173 ref.

4D-27. Uber die Beeinflussung der Erstarrungskristallisation von Magnesiumlegierungen durch Zirkonium und einige Eigenschaften von gegossenen Magnesium-Legierungen mit Zirkonium. (Influencing the Crystallization of Magnesium Alloys by Zirconium; Several Properties of Cast Zirconium-Containing Magnesium Alloys.) Franz Sauerwald. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 41-46.

Constitution diagram of Mg-Zr, the critical zirconium content, and the mechanism of grain refinement. The maximum grain refinement is obtained with 0.6% Zr, and Zr effects remarkable improvements in the properties of Mg alloys, especially in malleability, toughness, and corrosion resistance. Zr was found to have a similar effect on a series of polynary alloys of Mg.

4D-28. The Constitution of Aluminium-Copper-Magnesium Alloys. N. S. Brommelle and H. W. L. Phillips. *Journal of the Institute of Metals,* v. 75, Mar. 1949, p. 529-558.

Constitution of Al-rich portion of the above system was investigated over the range 0-40% Cu, 0-35% Mg by thermal analysis and microscopic examination. The occurrence of the two binary constituents, $CuAl_2$ and Mg_2Al_3, and of two ternary compounds, Al_2CuMg and Al_6CuMg_4, was confirmed. 39 ref.

4D-29. Observations on the Recrystallization Characteristics of Aluminium-Magnesium-Manganese Alloys. R. Chadwick and W. H. L. Hooper. *Journal of the Institute of Metals,* v. 75, Mar. 1949, p. 609-626.

Eleven binary and ternary alloys of commercial Al containing up to 1% Mg and 1.25% Mn were investigated, including effects of variations in cold working and annealing procedures.

4D-30. A Metallographic Study of Aluminum Alloy 3S. L. J. Barker. *Iron Age,* v. 163, May 26, 1949, p. 74-78.

Etching methods. Results reported indicate that background or secondary constituent structures carry through rolling and annealing operations and serve as a reliable guide to temper of the sheet, history of fabrication, and properties to be expected. Etchants, for development of the various structures.

4D-31. Grain Control in Wrought Aluminum and Magnesium Products. J. T. Hobbs, Jr. *American Society for Metals,* "Grain Control in Industrial Metallurgy", 1949, p. 209-271.

Methods of determining and reporting grain size. Factors effecting grain structure and effect of structure on properties. 56 ref.

4D-32. Oriented Arrangements of Thin Aluminum Films on Ionic Substrates. T. N. Rhodin, Jr. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 371-382.

Procedure and apparatus for forming and examining. Structure of films condensed in vacuum on clean ionic substrates is strongly influenced by the nature, geometry,

and temperature of ions in the base. Degree of orientation with respect to the base can be semiquantitatively correlated with a binding energy characteristic of the substrate. 15 ref.

4D-33. The Effect of Rolling and Annealing Procedures on the Structure and Grain-Size of Aluminium-Copper-Magnesium Alloy Strip. R. Chadwick, T. Ll. Richards, and K. G. Sumner. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 627-640.

Results, including effect on mechanical properties. The alloy contained 4.26% Cu, 0.79% Mg, 0.63% Mn, 0.41% Fe, 0.38% Si, 0.01% Ti, and traces of Zn and Ni.

4D-34. Brillouin Zone Effects in Aluminium Alloys. E. C. Ellwood. *Nature,* v. 163, May 14, 1949, p. 772.

It was found by density measurements at 283 and 318° C. that a defect lattice of the type reported by Bradley and Taylor is formed, there being 5.6% vacant lattice sites at 16.5 atomic % Zn (assuming that the pure aluminum used as a standard contained no vacant lattice sites) and less than 0.5% vacant sites at 25 atomic % Zn.

4D-35. Analyse par micrographie et par rayons X d'une nouvelle texture basaltique de solidification de lingots d'aluminium. (Analysis, by Means of Micrography and X-Rays, of a New "Basaltic" Structure in Aluminum Ingots.) Jean Herenguel and Paul Lacombe. *Comptes Rendus,* v. 228, Mar. 7, 1949, p. 846-848.

A new crystal structure obtained by semicontinuous casting. This structure appears in the form of elongated crystalline fibers, direction of which is nearly parallel to the axis of the ingot. Examination of other sections of the billet showed that, in reality, these fibers consist of an aggregation of flat scale-like crystals.

4D-36. Beitrag zur Untersuchung von Vierstofflegierungen. (Research on Quaternary Alloys.) Angelica Schrader. *Metall,* Apr. 1949, p. 110-115.

The aluminum corners of the Al-Cu-Mg-Si and Al-Fe-Mg-Si systems.

4D-37. Gefugebeobachtungen bei der Erstarrung von Aluminium-Silizium-und Aluminium-Kupfer-Magnesium-Legierungen. (Structure Observations on Solidifying Aluminum-Silicon and Aluminum-Copper-Magnesium Alloys.) Maria and August Buckeley. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Apr. 1949, p. 99-103.

Microstructures of Al-Si, Al-Si-Mg, and Al-Cu-Mg alloys quenched from different stages of solidification.

4D-38. Diffusion of Hydrogen Through Aluminum Tubes. Allen S. Russell. *Metal Progress,* v. 55, June 1949, p. 827-831.

Rate of diffusion through a particular type of Al tube was measured from 100 to 500° C. and at pressures of 1-75 cm. Hg. The rate was found to change rapidly with time at moderate temperatures. No significant data on the effect of temperature and pressure were obtained. The sample recrystallized and considerable grain growth occurred during the measurements. No large increase in total oxide-film thickness was observed. The rate was increased more than five-fold by high-voltage discharge. Diffusion of oxygen at 1 atm. at 500° C. was immeasurably low.

4D-39. Behaviour of Crystal Boundaries in Aluminium and Its Alloys During Melting. W. I. Pumphrey and J. V. Lyons. *Nature,* v. 163, June 18, 1949, p. 960-961.

4D-40. Dispersion des frequences des ondes acoustiques dans l'aluminium. (Dispersion of the Frequencies of Acoustic Waves in Aluminum.) Ph. Olmer. *Journal de Chimie Physique et de Physico-Chimie Biologique,* v. 46, Jan.-Feb. 1949, p. 20-25.

On the basis of the shape of the curves, certain conclusions were drawn concerning the characteristics of interactions among atoms in the interior of the crystal.

4D-41. Kalt- und Warmaushärtung einer Aluminium-Silizium-Magnesium-Gusslegierung. (Cold and Warm Age Hardening of an Aluminum-Silicon-Magnesium Cast Alloy.) Gustav Gurtler and Herta Weigelt. *Zeitschrift fur Metallkunde,* v. 40, Apr. 1949, p. 147-155.

Experimental results for an Al alloy containing 9.5% Si, 0.5% Mg, 0.3-0.4% Mn, and 0.3-0.4% Fe. Age hardening was conducted for periods up to nine months at 20, 100, 150, 200, 250, and 300° C. Changes in hardness and structure are shown.

4D-42. Recherches au microscope électronique sur les précipitations dans les alliages d'aluminium. (Research on Precipitation in Aluminum Alloys Using the Electron Microscope.) Raymond Castaing. *Comptes Rendus* (France), v. 228, Apr. 20, 1949, p. 1341-1343.

Submicroscopic precipitation present in an annealed Al-Cu alloy containing 4% Cu was particularly studied. Results indicate the presence of a precipitate (Al_2Cu) in the

form of small plates oriented parallel to the aluminum base. Metallographic results will be published later.

4D-43. Relation entre la grosseur du grain de recristallisation de l'aluminium de haute pureté et ses propriétés mécaniques. Influence des faibles additions sur la grosseur du grain. (Relation Between the Size of Recrystallized Grains of High-Purity Aluminum and Mechanical Properties. Influence of Small Additions on the Grain Size.) Henri Chossat. *Comptes Rendus* (France), v. 228, Apr. 20. 1949, p. 1344-1345.

The above was investigated for aluminum of 99.99 and 99.998% purity, differently heat treated.

4D-44. Segregation in Aluminium-Copper Alloys. D. E. Adams. *Journal of the Institute of Metals,* v. 75, June 1949, p. 809-838.

Segregation was measured in a number of ingots containing 3 and 7% Cu, made in such a way that turbulence was avoided and solidification took place in one direction only. Three well defined zones were observed. From results it is concluded that capillary forces are the most important factor influencing interdendritic flow in the feeding of solidification shrinkage; atmospheric pressure, gravitation, and released gases being less important. Methods of minimizing segregation.

4D-45. The Constitution of the Aluminium-Rich Aluminium-Cobalt-Copper Alloys, with Special Reference to the Role of Transitional Metals in Alloy Formation. P. C. L. Pfeil and G. V. Raynor. *Proceedings of the Royal Society,* ser. A, v. 197, June 22, 1949, p. 321-335.

12 ref.

4D-46. Relation entre l'existence d'imperfections de structure des cristaux uniques d'Aluminium pur et d'alliages Al-Zn et le processus de recristallisation. (Relationship Between the Existence of Structural Imperfections in Single Crystals of Pure Aluminum and in Al-Zn Alloys and the Process of Recrystallization.) P. Lacombe and A. Berghezan. *Physica,* v. 15 Apr. 1949, p. 161-167; discussion, p. 167-169.

The existence of a crystalline substructure is shown to be closely connected with the manner of recrystallization of the metal and not with the process of aging observable at ordinary temperature. Experimental method.

4D-47. Inclusions in Aluminium Crystals. (In English.) T. J. Tiedema, W. May, and W. G. Burgers. *Acta Crystallographica,* v. 2, June 1949, p. 151-154.

Crystals, growing by recrystallization in fine-grained material, often do not consume some grains of the original material. They contain a number of inclusions, which do not vanish even after very long annealing. These reflect light simultaneously in the same direction. By means of the etching method of Lacombe and Beaujard and an X-ray method it is proved that these inclusions are deformed grains of the original material possessing a spinel-twin relationship to the surrounding crystal. All four possible spinel-twin positions are represented. This is not valid when the "inclusions" are larger than the average original grain size. By means of the etching method, it was possible to determine the orientation of inclusions with dimensions down to 30μ. 21 ref.

4D-48. Laminated Structure in Recrystallized Aluminium. G. L. Bucknell and G. A. Geach. *Nature,* v. 164, Aug. 6, 1949, p. 231.

As shown by electron microscope examination. The structure has a mean sparing of about 600 A., and the laminations themselves have a nodular structure.

4D-49. Über die Löslichkeit von Chrom, Vanadium, Titan, Mangan, Zirkon in Aluminiumlegierungen. (The Solubility of Chromium, Vanadium, Titanium, Manganese, and Zirconium in Aluminum Alloys.) Gustav Siebel. *Zeitschrift für Metallkunde,* v. 40, June 1949, p. 214-217.

The solubility at different temperatures of the above was determined in an Al alloy containing 4.5% Zn and 3.5% Mg.

4D-50. The Equilibrium Diagram of the System Aluminum-Magnesium. G. V. Raynor. *Institute of Metals,* Annotated Equilibrium Diagrams No. 5, Nov. 1945, 5 pages.

One of a series. 32 ref.

4D-51. Analyse d'une texture de solidification du type basaltique. (Analysis of a Solidification Structure of the Basaltic Type.) J. Hérenguel. *Revue de Métallurgie,* v. 46, May 1949, p. 309-314.

Aluminum 99.5% pure was solidified at a very regular high rate resulting in the basaltic structure. Results of micrographic and crystallographic investigation.

4D-52: Emploi de l'oxydation anodique pour l'étude de l'homogénéité des solutions solides Al-Mg. (Application of Anodic Oxidation to Study of Homo-

geneity of Al-Mg Solid Solutions.) J. Hérenguel and R. Segond. *Revue de Métallurgie,* v. 46, June 1949, p. 376-381; discussion, p. 382.

The presence of surface irregularities on the above solid solutions restricts to a great extent their electropolishing. Causes of formation of such structural defects and methods for their elimination.

4D-53. Gefüge- und Eigenschaftsanomalien in manganhaltigen Aluminiumlegierungen als Folge von Unterkühlungen. (Structural and Property Anomalies in Manganese-Containing Aluminum Alloys as a Result of Supercooling.) K. L. Dreyer and M. Dudek. *Metall,* July 1949, p. 219-222.

Cause of the above anomalies was found to be the great tendency of these alloys to supercool, resulting in supersaturated Mn solutions. Heat treating causes the excess Mn to precipitate in fine particles, thus causing further notable property changes. Similar supercooling effects have been noted with additions of Cr, Ti, and V. 29 ref.

4D-54. Zur Kenntnis des manganhaltigen Gefügebestandteils in technischen Aluminiumlegierungen. (Concerning the Manganese-Containing Constituents in Commercial Aluminum Alloys.) Hugo Joachim Seemann and Maria Dudek. *Zeitschrift für Metallkunde,* v. 39, Oct. 1948, p. 319-320.

Photomicrographs reveal presence of the above phase at the grain boundaries in duralumin annealed at temperatures above 500° C.

4D-55. Solubility of Titanium in Liquid Magnesium. K. T. Aust and L. M. Pidgeon. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 585-587.

Apparatus and procedure. Solubility was found to be extremely small. Freezing-point and interplanar-spacing values for high-purity Mg. 14 ref.

4D-56. Recrystallization Texture and Coarsening Texture in High Purity Aluminum. Paul A. Beck. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 627-634.

Experimental determination of the relationship among deformation, recrystallization, and coarsening textures. Results are compared with those of other investigators, and are critically analyzed. Includes pole-figure diagrams and macrographs. 25 ref.

4D-57. Influence de la répartition des imperfections de structure des cristaux de solution solide aluminium-zinc sur la cinétique de leur durcissement structural à 20°. (Influence of the Structural Defects in Al-Zn Solid-Solution Crystals on the Kinetics of Their Structural Hardening at 20° C.) Paul Lacombe and Aurel Berghezan. *Comptes Rendus* (France), v. 228, May 30, 1949, p. 1733-1735.

The degree of structural hardening of polycrystalline test specimens differs greatly according to the type of structure present. Data for an Al alloy containing 8% Zn.

4D-58. Sur les images au microscope électronique des alliages aluminium-cuivre durcis. (Surface Appearance of Hardened Al-Cu Alloys as Revealed by Electron Microscopy.) Raymond Castaing and André Guinier. *Comptes Rendus* (France), v. 228, June 27, 1949, p. 2033-2035.

Different surface structures obtained during hardening of a 4% Ca aluminum alloy, and corresponding to those indicated by X-ray investigation, are determined by electron microscopy.

4D-59. The Transverse Bending of Single Crystals of Aluminum. M. K. Yen and W. R. Hibbard, Jr. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 710-720.

Mode of testing, using the two-point loading method. Attention was given to both lattice distortion and flow characteristics during formation. 25 ref.

4D-60. Growth and Perfection of Beryllium Crystals. I. Growth of Large Beryllium Crystals by Solidification. II. Studies of Crystal Perfection. Louis Gold. *U. S. Atomic Energy Commission,* AECD-2643 & 2645, July 20, 1949 and July 21, 1949, 32 pages and 18 pages.

Part I describes method and difficulties. Part II describes Rocking curve measurements, Laue patterns, and fractographic examination of the resulting crystals. 41 ref.

4D-61. Untersuchungen zum Keimproblem in Leichtmetallschmelzen. (Research on the Nuclei Problem in Light-Metal Melts.) E. Onitsch. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 295-298.

Melts rich in nuclei will result in fine-granular structures under any cooling conditions, while melts with few nuclei will have a fine-granular structure only when cooled at a rapid rate. 14 ref.

4D-62. Oriented Arrangements of Thin Aluminium Films Formed on Ionic Substrates. T. N. Rhodin, Jr. *Discussions of the Faraday Society,* No. 5 (Crystal Growth), 1949, p. 215-233.

Previously abstracted from *Journal of Metals.* See item 4D-32, 1949.

4D-63. Über die Deutung der Entmischungsvorgänge in Mischkristallen unter besonderer Berucksichtigung der Systeme Aluminium-Kupfer und Aluminium-Silber. (The Significance of Precipitation Phenomena in Solid Solutions With Special Attention to the Aluminum-Copper and Aluminum-Silver Systems.) Heinz Jagodzinski and Fritz Laves. *Zeitschrift für Metallkunde,* v. 40, Aug. 1949, p. 296-305.

Problem of diffusion and of the closely related formation of nuclei. Guinier's theory is critically evaluated and his results compared with those of the present authors for grain dimensions of Al-Cu and Al-Ag alloys. 28 ref.

4D-64. A New Phase in the System Al-Si-Li. (In Russian.) E. A. Boom. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 645-646.

The nature of an Al-Si alloy modified by addition of Li was investigated metallographically. Results indicate presence of a new phase in alloys of high Li content. This new phase appears to be $Li_4Al_4Si_2$.

4D-65. Effect of Composition on Grain Growth in Aluminum-Magnesium Solid Solutions. L. J. Demer and P. A. Beck. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 147-162.

Previously abstracted from *Metals Technology*. See item 4d-18, 1948.

4D-66. Effect of a Dispersed Phase on Grain Growth in Al-Mn Alloys. P. A. Beck, M. L. Holzworth and P. R. Sperry. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 163-192.

Previously abstracted from *Metals Technology*. See item 4d-40, 1948.

4D-67. Solubility of Iron in Solid Aluminum. J. K. Edgar. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 225-229.

Previously abstracted from *Metals Technology*. See item 4d-19, 1948.

4D-68. Some Effects of Applied Stresses on Precipitation Phenomena. W. L. Finlay and W. R. Hibbard, Jr. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 255-272.

Previously abstracted from *Metals Technology*. See item 4d-39, 1948.

4D-69. Hydrogen in Aluminum. Y. Dardel. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 273-286.

Previously abstracted from *Metals Technology*. See item 4D-1, 1949.

4D-70. L'évolution structurale des alliages Aluminium-Cuivre 4% trempés. Le phénomène de réversion. (Structural Transformation of Aluminum Alloys Containing 4% Copper. The Phenomenon of Reversion.) Adrien Salulnier. *Revue de l'Aluminium,* v. 26, July-Aug. 1949, p. 235-238.

Phenomena accompanying room-temperature and artificial aging which take place after quenching. Reversion softens the alloy (whereas artificial aging conducted immediately after quenching hardens it slightly) because prior aging has caused formation of high latent-energy zones allowing partial recrystallization. A new heat treatment—interrupted artificial aging—may be useful for reversion in numerous industrial applications.

4D-71. Structure of Certain Al-Mg Alloys. (In Russian.) E. M. Savitskii and M. A. Tylkina. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, July 1, 1949, p. 81-83.

An observed anomaly in the variation of properties of Al-Mg alloys was investigated by means of X-ray and microstructural analysis to determine its causes. Quenching deformed specimens from 400° C. in ice water indicated existence of a single-phase structure between 38.9 and 41.3% Mg, contrary to previous literature data.

4D-72. Les gaz dans l'Aluminium et ses alliages. (Gases in Aluminum and Its Alloys.) R. Castro and M. Armand. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 594-616.

Critical survey of the literature with emphasis on the $Al-H_2$ system. State of gas in aluminum; effect on properties of the metal; origin of the gas in the metal; methods for control of gas content; and methods for counteracting harmful effects of gas present. 131 ref.

4D-73. Physicochemical Investigation of Al-Si-Li Alloys. (In Russian.) E. A. Boom. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 871-874.

The nature of the modification of alloys of the "silumin" type (Al + 5-13% Si) caused by addition of a small amount of Li (up to 1%) was investigated, particularly the mechanism of diffusion of Li into the alloy. Obtained data show the presence of a new phase, which is assumed to be a ternary lithium silicide, $Li_3Al_2Si_2$. This assumption was confirmed by chemical analysis. Mechanical properties of this phase.

SECTION V

POWDER METALLURGY

5A—General

5A-1. The Sintering of Metal Powders. Robert Talmage. *Industrial Heating,* v. 15, Dec. 1948, p. 2098, 2100, 2102, 2104, 2106, 2180-2181.

Gives an example from each of two different categories—pure metal or completely alloyed powder, and powders mixed in various percentages to produce an alloy. Importance of proper sintering times and temperatures. The great number of variables involved and the need for additional experimental work.

5A-2. Lead-Grid Study of Metal Powder Compaction. Robert Kamm, M. A. Steinberg, and John Wulff. *Metals Technology,* v. 15, Dec. 1948, TP 2487, 13 pages.

A lead-grid method is used for exploring the distribution of strain and density within metal-powder compacts. Circular-hole grids can be more accurately made and, when deformed within the powder, more readily measured and analyzed. Effect of lubrication, compact height, pressure, speed of pressing, and vacuum pressing.

5A-3. Powder Metallurgy in Japan—Post-War Developments. Kazuhiko Ogawa. *Powder Metallurgy Bulletin,* v. 3, Nov. 1948, p. 128-129.

Excerpts from a letter outline work under way and recent developments.

5A-4. Plastic Bonding of Boron Powder. L. Hays and J. E. Burke. *U. S. Atomic Energy Commission,* AECD-2279, Oct. 4, 1944, 2 pages.

Describes a method for bonding boron powder by wet-tamping with methyl methacrylate monomer and polymerizing the monomer to produce a piece which has a boron density of at least 1.6 g per cc. The method has the advantage that almost any shape can be made without constructing expensive dies or using a press. It should be possible to bond other materials in the same manner.

5A-5. Uber einige neue Verfahren der Pulvermetallurgie. (Concerning Some New Methods for Powder Metallurgy.) Gunter Wassermann. *Metallforschung,* v. 2, May, 1947, p. 129-137.

Customary methods and several new methods.

5A-6. The Influence of the Surface Structure of Individual Powder Particles in the Production of Powder Metal Components. A Discussion of Fundamental Principles. S. J. Garvin. *Murex Review,* v. 1, No. 2, 1948, p. 17-32.

5A-7. Powder Metallurgy. Wallace W. Beaver. *Metals Review,* v. 22, Jan. 1949, p. 5-8.

A review based on the technical literature for 1947-48. References to "ASM Review of Current Metal Literature."

5A-8. Powder Metallurgy in 1948. R. A. Hetzig. *Chemical Age,* v. 60, Jan 8, 1949, p. 68-71.

A review. 36 ref.

5A-9. Relationship of Shrinkage and Properties of Powder Compacts to Their Density (Porosity). (In Russian.) M. Yu. Bal'shin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1179-1184.

An elaboration of earlier studies on mechanism governing relationship between shrinkage and density. Powders used in study were Cu, Cu + graphite; Cu + Sn; Fe; and Fe + Cu.

5A-10. Pressure Distribution in Compacting Metal Powders. Pol Duwez and Leo Zwell. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 137-144.

Pressure at various points on the bottom and sides of a die 1.50 in. in diameter was measured by means of small piston dynamometers and

resistance-sensitive strain gages. Pressure distribution inside the compact was also determined by an indirect method based on density measurements.

5A-11. Self-Diffusion in Sintering of Metallic Particles. G. C. Kuczynski. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 169-178.

The radius of the interface formed during bonding in simple systems composed of spherical particles and large blocks of Ag and Cu was studied as a function of time and temperature. It is believed that the mechanism involved is fundamental to sintering operations. The mechanism is predominantly that of volume diffusion for large particles and higher temperatures. At the beginning of sintering, surface diffusion is operative. The surface-diffusion coefficient of Cu was determined. 14 ref.

5A-12. Air Grading of Sub-Sieve Powders. *Industrial Diamond Review,* v. 9, Jan. 1948, p. 19-22. Based on "Particle-Size Analysis of Metal Powders," Metals Disintegrating Co., Elizabeth, N. J.

The Roller Air Analyzer and results obtained with the Fisher Sub-Sieve Sizer.

5A-13. The Physical Character of the Cohesion Between Powder Particles. J. H. McKee. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 106-115.

Theory in which the important part played by very fine particles in the sintering process was established. Size distribution below −200 B.S.S. must be considered in prediction of sinterability. 17 ref.

5A-14. Powder Metallurgy. W. S. White. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 30. Based on lecture by O. W. Ellis.

5A-15. Particle-Size Distribution in Powder Metallurgy. *Industrial Heating,* v. 16, Feb. 1949, p. 252, 254.

Recent Bureau of Standards work on sieving results for different types of powdered metals.

5A-16. Ceramic Developments at the National Advisory Committee for Aeronautics. A. R. Bobrowsky. *Technical Data Digest,* v. 14, Mar. 1, 1949, p. 18-22.

Progress of past year in procedures and equipment for evaluation of ceramic and ceramic-metal materials.

5A-17. Investigation of the Process of Shrinkage of Single-Phase Metal-Ceramic Bodies. III. Laws Determining Volume Changes of Metal-Ceramic Bodies During Firing (Reply to M. Yu. Bal'shin). (In Russian.) V. A. Ivensen. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1290-1305.

Critically analyzes Bal'shin's textbook, "Powder Metallurgy". Points out several erroneous assumptions.

5A-18. Certain Comments on Ivensen's Article: "Investigation of the Process of Shrinkage of Metal-Ceramic Bodies." (In Russian.) M. Yu. Bal'shin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1332-1335.

Refutation of Ivensen's criticism of Bal'shin's book. (See item 5A-17.)

5A-19. Where Does Powder Metallurgy Stand Today? H. R. Clauser. *Materials & Methods,* v. 29, Mar. 1949, p. 45-48.

The ability of powder metallurgy to provide low-cost parts with satisfactory properties depends on solution of a number of problems.

5A-20. Recent Developments in Powder Metallurgy. Supplement to "Powder Metallurgy—Its Physics and Production." Part I. Paul Schwarzkopf. *Powder Metallurgy Bulletin,* v. 4, Mar. 1949, p. 28-56.

Comprehensive classified review of new developments since publication of book in 1947. 183 ref.

5A-21. Fundamental Study, and Equipment for Sintering and Testing of Cermet Bodies. A. R. Blackburn, T. S. Shevlin, and H. R. Lowers. *Journal of the American Ceramic Society,* v. 32, Mar. 1, 1949, p. 81-98.

The theoretical aspects of fundamental chemistry experiments which accompanied the laboratory development of test specimens. Metal powders (Ni, Fe, Co, Cr, and Cr-B) were fired on pure Al_2O_3 tile in various controlled atmospheres. Special furnaces necessary for the fundamental study and for sintering cermet specimens. Equipment for determining instantaneous modulus of rupture and tensile rupture, and long-time stress-rupture in bending at temperatures up to 2400° F.

5A-22. Powder Metallurgy No Panacea. R. L. Ziegfeld and K. H. Roll. *Iron Age,* v. 163, Mar. 24, 1949, p. 68-71.

Admitting that powder metallurgy is not a cure-all for all production problems, the authors emphasize its advantages while critically evaluating its role in industry.

5A-23. Powder Metallurgy: Improved Technology Widens Application. G. J. Comstock, John D. Shaw, C. L. Clark, and W. V. Knopp. *Iron Age,* v. 163, Mar. 24, 1949, p. 72-74.

Recent developments, including hot pressing of alloy powders and application in the high-temperature-alloy field.

5A-24. How Ford Produces Parts From Metal Powders. E. E. Ensign. *Iron Age,* v. 163, Mar. 24, 1949, p. 76-80.

Methods and equipment, including the automatic restriking operation. Automatic machining of external grooves in certain types of bushings.

5A-25. Pressed Metal Powder Applications in the Automotive Industry. D. C. Bradley. *Iron Age,* v. 163, Mar. 24, 1949, p. 86-89.

Wide variety of powdered-metal parts used by General Motors Chrysler, and Ford.

5A-26. (Book) **Powder Metallurgy. Vol. I.** Claus G. Goetzel. 806 pages. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. $15.00.

First of a three-volume work on the technology of metal powders and their products. It deals with methods of powder production, characteristics and properties of powders, the molding of powders into solid forms, hot pressing apparatus and techniques, sintering, heat treating, finishing treatments, and related subjects.

5A-27. (Book) **Poroshkovoe Metallovedenie.** (Powder Metallurgy.) M. Yu. Bal'shin. 332 pages. 1948. State Scientific-Technical Publishing House for Literature on Ferrous and Nonferrous Metallurgy, Moscow, U.S.S.R.

A handbook for production engineers, research workers, and students. Theoretical bases; methods of production in the USSR and abroad; physical and chemical processes taking place during the production; mechanical properties of finished products; and applications of individual products. 156 ref.

5A-28. Eine Methode zur Verdichtung komplizierter Metallpulverkörper. (A Method for Compressing Complex Metal-Powder Bodies.) Hermann Silbereisen. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 66-67.

A new automatic process suitable for the mass prodution of sintered parts.

5A-29. The Design Engineer Looks on Powder Metallurgy. Joseph L. Bonnano. *Electrical Manufacturing,* v. 43, May 1949, p. 103, 172, 174, 176.

Some design guideposts and selected case-histories that underscore the advantages of powder-metallurgy techniques. Toy-train parts are cited.

5A-30. The Design and Operation of Small Mills for Mixing Powder. D. Summers-Smith. *Metallurgia,* v. 39, Apr. 1949, p. 309-311.

Two sizes of ball mills designed to facilitate metallurgical research by powder-metallurgy methods. The larger is suitable for mixing samples of about 10 g. and the smaller for 1-g. samples.

5A-31. Dollars-and-Cents Advantages of Powder-Metal Parts. Joseph L. Bonnano. *Machine Design,* v. 21, May 1949, p. 133-136, 180, 182, 184.

Examples showing cost savings made possible by replacement of conventional by powdered-metal parts. Other advantages.

5A-32. Die theoretischen Grundlagen der Frittungsvorgänge innerhalb von Pulvern. (Theoretical Basis of the Process of Sintering of Powders.) G. F. Huttig. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 93-99.

A theory of the sintering action of powders by studying the behavior of an isolated crystal; also the behavior of two or more similar crystals in contact with each other with increasing temperature. The theories developed are based mainly on experiments with metal oxides. 24 ref.

5A-33. Schwindung und Quellung beim Sintern von Metallen. (Shrinkage and Swelling in the Sintering of Metals.) K. May. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 154-163.

An experimental study of the factors (grain size, pressure, temperature, and phase transformations) affecting the above in pure metals and alloys. The theory and mechanism of compression swelling in Fe-Zn and Fe-C alloys are explained. 14 ref.

5A-34. Problems of Pressing Metal Powders. H. W. Greenwood. *Machinery* (London), v. 74, May 26, 1949, p. 696-697.

Including work hardening by ball milling or vigorous mechanical screening, and infiltration techniques—production of porous objects with the pores filled with a low-melting-point metal.

5A-35. Recent Developments in Powder Metallurgy. Supplement to "Powder Metallurgy—Its Physics and Production." Part II. Products. Paul Schwarzkopf. *Powder Metallurgy Bulletin,* v. 4, May 1949, p. 64-111.

Comprehensive review. 300 ref.

5A-36. Report of Committee B-9 on Metal Powders and Metal Powder Products. *American Society for Test-*

ing Materials, Preprint 16, 1949, 7 pages.

Includes proposed tentative definitions of terms used in powder metallurgy.

5A-37. A Compressibility Test for Metal Powders. F. V. Lenel. *ASTM Bulletin,* May 1949, p. 52-56.

Influence of various lubricants on compressibility of three copper and three iron powders was determined in a cooperative test program.

5A-38. Beeinflussung des Schwundes durch Zugkräfte beim Sintern von Metallpulvern. (Influencing Shrinkage by Application of Tensile Stress During Sintering of Metal Powders.) Walther Dawihl and Walter Rix. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 115-117.

Application of a load of as little as 25 g. per sq. mm. is almost sufficient to eliminate shrinkage in the longitudinal direction, while shrinkage is being intensified normal to the direction of application of tensile stress. Apparatus used. Results of application to cobalt powder compacts.

5A-39. Magnets From Pure Iron Powder. Robert Steinitz. *Metal Progress,* v. 55, June 1949, p. 858, 860, 862, 864, 866, 868.

Previously abstracted from *Powder Metallurgy Bulletin,* item 5B-1, 1949.

5A-40. Powder Metallurgy. J. F. Mills. *Mine & Quarry Engineering,* v. 15, June 1949, p. 175-181.

Processes, products, and applications.

5A-41. Scope and Limitations of the Powder Metallurgy Process. E. Raymond Engstrand, Kenneth M. Gleszer, and John W. Polonetz. *Product Engineering,* v. 20, July 1949, p. 123-127.

Mechanical, electrical, structural, and special parts can be adapted to powder metallurgy. Design limitations and subsequent operations of machining, coining, hardening, and finishing. Physical characteristics of test bars are tabulated. Includes design diagrams.

5A-42. (Book) Pulvermetallurgie und Sinterwerkstoffe. (Powder Metallurgy and Sintered Materials.) Ed. 2. Richard Kieffer and Werner Hotop. 412 pages. 1948. Springer-Verlag, Berlin, Germany.

A comprehensive summary review of the most important domestic and foreign literature on methods for a wide variety of powdered metals.

5A-43. Powder Metallurgy; Survey of Advances Made From Pre-War Practice. H. W. Greenwood. *Metal Industry,* v. 75, July 8, 1949, p. 32-33.

5A-44. (Book) Powder Metallurgy in Germany During the Period 1939-45. R. A. Hetzig. H. M. Stationery Office, York House, Kingsway, London, W.C.2, England. (BIOS Overall Report No. 20.) 6d. net.

Essentials of some 250 British and foreign reports dealing with German developments.

5A-45. Designing for Production by Powder Metallurgy. Joseph Bonnano. *Steel,* v. 126, Aug. 22, 1949, p. 68-70, 72, 74, 77.

Manufacture of model-train parts. Large savings in labor and material are obtained by replacement of other methods by powder metallurgy.

5A-46. Informal Open Discussion of Powder Metallurgy. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 5-20.

5A-47. Effects of Impurities in Metal Powders. F. V. Lenel. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 65-69; discussion, p. 69-73.

Some basic principles which govern the effect of impurities in metals and alloys in general. Examples are taken from the effects of impurities on the properties of molded and sintered compacts, processing of the powders, and also on preparation of metal powders.

5A-48. Powder Metallurgy from the Design Engineer's Viewpoint. Joseph L. Bonnano. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 74-91; discussion, p. 91-92.

See abstract from *Electrical Manufacturing,* item 5A-29, 1949.

5A-49. Determination of Boundary Stresses During the Compression of Cylindrical Powder Compacts. M. E. Shank and John Wulff. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 561-570.

Electrical strain-gage technique based on the elastic properties of the thick-walled tube used as the die. Theory of the method; experimental procedure and results. 10 ref.

5A-50. A Dilatometric Study of the Sintering of Metal Powder Compacts. Pol Duwez and Howard Martens. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 571-577.

A systematic investigation of change in length during sintering of compacts. Pure metals investigated were Cu, Fe, Co, and Mo.

5A-51. Investigation of Bonding Between Metals and Ceramics. I. Nickel, Cobalt, Iron, or Chromium With Boron Carbide. H. J. Hamjian and W. G. Lidman. *National Advisory Committee for Aeronautics,* Technical Note 1948, Sept. 1949, 23 pages.

Investigated after exposure at temperatures above the melting temperature of the metal constituent. Simple bonding experiments were made to indicate the compatibility of various metals and a ceramic to form a ceramal. Temperature, time at temperature, and atmosphere suitable for sintering the ceramal are indicated by results of preliminary experiments. 10 ref.

5A-52. Penetration of Sintered Metals by Solutions of Surface-Active Agents. A. J. Finks and N. J. Petito. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1101-1102.

Method which indicates the comparative wetting and penetrating qualities of surface-active agents. Application to stainless steel filter elements of varying porosities. Suggests application to other metals, glass fabrics, and for research on metal cleaning or lubrication.

5A-53. Structural Parts From Metal Powders. H. R. Clauser. *Materials & Methods,* v. 30, Sept. 1949, p. 85-92.

The various metal powders used for structural parts; selection considerations and design principles.

5A-54. Powder Metallurgy. J. P. Saville. *Discovery,* v. 10, Sept. 1949, p. 294-298.

Applications and limitations of the process; powder metal magnets.

5A-55. Keramische Stoffe im Austausch für Metalle. (Ceramics as Substitutes for Metals.) F. Reinhart. *Zeitschrift des vereines Deutscher Ingenieure,* v. 91, July 15, 1949, p. 341-343.

Practicability of using ceramics (with and without metallic admixtures) for movable and immovable machine parts, and complete machines and implements. Methods of working ceramic materials.

5A-56. Design in Powder Metallurgy. H. W. Greenwood. *Metallurgia,* v. 40, Sept. 1949, p. 255-256.

Importance of proper design.

5A-57. On the Initiation of Reactions Between Solid Phases. A. Smekal. *Powder Metallurgy Bulletin,* v. 4, Sept. 1949, p. 120-126.

The first mechanical contact between two particles takes place over areas which, from molecular dimensions up to diameters of the order of 1 micron, permit utilization of the full strength of the chemical bonding forces. When critical resistivity values are reached, the structural elements become highly reactive. This stage leads locally — depending on chemical nature and homogeneous or heterogeneous character of the components—to chemical reactions, alloy formation or bonding by fusion. To initiate such processes, the small loads involved in the packing or mixing of loose powders are shown to be fully sufficient. 14 ref.

5A-58. Determination of Green Strength by the Transverse Rupture Test. J. P. Scanlan and R. P. Seelig. *Powder Metallurgy Bulletin,* v. 4, Sept. 1949, p. 128-132.

Method for application to cold-pressed compacts. Typical data for Fe and Cu compacts.

5A-59. Untersuchungen über die Bedeutung des Begriffes "Fulldichte" als Kenngrösse für die Eigenschaften von Metallpulvern. (Research on the Meaning of the Term "Bulk Density" as an Index for the Properties of Metal Powders.) H. Bernstorff and F. Moser. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 317-323.

The volume of a given weight of loosely poured powder depends on size, density, porosity, and surface condition of the individual grains. The change in "bulk density" resulting from addition of 0.3-1.5% graphite depends on structure, form, and size of the grains of iron powder. Shows that the grain structure and size of a sintered article before and after annealing depend largely on bulk density of the powder.

5A-60. Seminar on the Kinetics of Sintering. A. J. Shaler. *Journal of Metals* (Transactions Section), v. 1, Nov. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185) p. 796-804; discussion, p. 804-813.

Critical analysis of literature data and results of simple experiments. In a limited range of cases, it is now feasible to predict the course of sintering with some precision, and some observations can now be interpreted with less difficulty. 29 ref.

5A-61. Fundamental Study, and Equipment for Sintering and Testing of Cermet Bodies: IV. Developing and Testing Equipment. T. S. Shevlin and A. R. Blackburn. *Journal of the American Ceramic Society,* v. 32, Nov. 1, 1949, p. 363-366.

A relatively large molybdenum-wound resistor furnace, a diamond-wheel rod-grinding machine, a tensile stress-rupture machine, and thermal-expansion equipment used for the development and testing of cermets.

5A-62. Pulvermetallurgie: Grundlagen, Aussichten und Zukunftsaufgaben.

(Powder Metallurgy: Principles, Prospects, and Future Problems.) Hans Schrader and Hermann Fahlenbrach. *Zeitschrift des vereines Deutscher Ingenieure,* v. 91, Oct. 1, 1949, p. 485-492.

An experimental and theoretical contribution to the above. 37 ref.

5A-63. Lead-Grid Study of Metal Powder Compaction. R. Kamm, M. A. Steinberg, and J. Wulff. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 694-706.

Previously abstracted from *Metals Technology.* See item 5A-2, 1949.

5A-64. New Trends in Powder Metallurgy. *Chemical Age,* v. 61, Nov. 5, 1949, p. 631-633.

Reviews Swiss and Czechoslovak modifications and development of nonporous compacts on the basis of recent patent literature.

5A-65. Powder Metallurgy in Germany. *Metal Progress,* v. 56, Nov. 1949, p. 736, 738. Condensed from "Powder Metallurgy in Germany During the Period 1939-1945", by R. A. Hetzig, H. M. Stationary Office, London, 1949. (BIOS Overall Report No. 20.)

Previously abstracted from original. See item 5A-44, 1949.

5A-66. Relationship of Mechanical Properties of Metals Produced by Powder Metallurgy to Porosity and Overall Properties of Porous Powdered-Metal Compacts. (In Russian.) *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 831-834.

Proposes formula for the above, based on the assumption that the index of the mechanical strength of such metals, in the first approximation, is a constant of the material independent of its porosity and that the compressibility is also a factor in the mechanical strength index.

5B—Ferrous

5B-1. Permanent Magnets From Pure Iron Powder. Robert Steinitz. *Powder Metallurgy Bulletin,* v. 3, Nov. 1948, p. 124-127.

This development has reached large-scale commercial application only in France. 14 ref.

5B-2. Alloy Steels; Production by Powder Metallurgy. H. W. Greenwood. *Iron and Steel,* v. 22, Jan. 1949, p. 9-10.

What has been done in this field and advantages over conventional methods.

5B-3. Elektrolytisk framställning av järnpulver. (Production of Electrolytic Iron Powder.) Gösta Wranglen. *Jernkontorets Annaler,* v. 132, no. 12, 1948, p. 501-516.

Electrolytic metal powders can be produced either by direct deposition at the cathode or by grinding of a coherent deposit. In the case of iron the latter method is the simplest and cheapest. Conditions of electrolysis in each case. Influence of structure of the deposited iron on shape of the powder particles. The fibrous structure of the normal deposit gives long needlelike particles after grinding which are undesirable for sintering. Three methods are proposed for modifying this structure. Industrial applications, particularly the anode material and the anode process which has been successfully applied by two small plants in Sweden. 23 ref.

5B-4. Diffusion in Iron-Silicon Compacts. F. W. Glaser. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 19-22.

Object of the work was to follow the progress of bonding and diffusion during the sintering of Fe-Si compacts. Electrical-resistivity measurements were used. Three series of specimens were prepared: cold pressed and sintered; hot pressed and annealed; and prealloyed, crushed to —100 mesh, and hot pressed.

5B-5. (Book.) **Determination of the Effect of Particle Size on the Properties of Commercial Iron Powders and Compacts Made From These Powders by Conventional Cold Pressing and Sintering Techniques.** 306 pages. July 1948. Stevens Institute of Technology, Powder Metallurgy Div., Hoboken, N. J. Published by Office of Technical Services, U. S. Dept. of Commerce, Washington.

Results of a series of tests made to determine the effect of particle size on physical properties of seven commercial iron powders and compacts prepared from these powders by standard powder-metallurgy techniques. Scope includes 12 standard tests; 5 special tests; and statistical analysis of tensile strengths of unreduced powders.

5B-6. TV Parts Made by Powder Metallurgy. *Iron Age,* v. 163, Mar. 24, 1949, p. 74.

Method using iron powders for production of high-voltage transformer cores used in television deflection circuits.

5B-7. Physical Properties of Reduced

Iron Powder Plus Graphite and Copper. George Stern. *Iron Age,* v. 163, Mar. 24, 1949, p. 81-85.

Results of an investigation in which mixtures of a commercial grade of reduced iron plus 0.40 to 1.05% graphite and 2 and 5% Cu were prepared, treated by means of a cycle considered commercially feasible, subjected to various standard steel heat treatments, and then studied for physical properties and microstructure.

5B-8. Magnetic Fluid Clutch Employs Iron Powder. *Iron Age,* v. 163, Mar. 24, 1949, p. 90.

The magnetic fluid contains carbonyl E iron powder, a silicone fluid, and polethylene glycol oleate.

5B-9. Die Grundlagen des Roheisen-Zunder-Verfahrens zur Herstellung von Eisenpulver. (The Principles of the Crude-Iron-Ignition Process for Producing Iron Powder.) Gerhard Naeser, Hermann Steffe, and Werner Scholz. *Stahl und Eisen,* v. 68, Sept. 9, 1948, p. 346-353.

New process consists of spraying molten iron-carbon alloys under controlled partial-oxidation conditions. The physicochemical and technical principles of the various operations; the constitution of the powder and its behavior during pressing and sintering. Experimental data. 18 ref.

5B-10. Prealloyed Steel Powders. George A. Roberts and Arthur H. Grobe. *Iron Age,* v. 163, Mar. 31, 1949, p. 78-79.

Initial plant production unit of Vanadium-Alloys Steel Co., which has been successfully used to produce a wide variety of metallic alloys having unusually good mechanical properties. The process consists of disintegrating a small molten metal stream through a zirconia nozzle by means of water jets. The powder is dewatered, dried, reduced, annealed, and screened. Potential applications.

5B-11. High Strength Parts Made From Prealloyed Steel Powders. *Steel,* v. 124, May 9, 1949, p. 114.

Method used for production of a complete series of prealloyed steel powders that can subsequently be heat treated to high hardness and strength levels. A small molten metal stream is disintegrated by water jets. The product is dewatered, furnace dried, and annealed.

5B-12. Dauerfestigkeit von Sintereisen-Werkstoffen. (Fatigue Strength of Sintered-Iron Products.) M. Hempel and H. Wiemer. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 11-17.

Effects of powder composition and properties and of sintering pressure on fatigue and tensile strength. Methods of testing and results. 16 ref.

5B-13. Der Stand der Fertigungstechnik in der Pulvermetallurgie des Eisens. (The Status of Production Technique in the Powder Metallurgy of Iron.) H. Timmerbeil and O. H. Hummel. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 30-35.

Production and properties (hardness, wear resistance, weldability, and workability) of sintered metal parts. Applications. 12 ref.

5B-14. Betrachtungen zum Reaktionsverlauf des Sinterungsvorganges von Eisenpulver. (Observations on the Process of Sintering of Iron Powder.) H. Bernstorff. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 103-106.

Production of metal powders by centrifugal process; sieve analysis, composition, and mechanical properties of the test powder; effect of sintering conditions on mechanical properties and structure; and reaction mechanism involved. 13 ref.

5B-15. Uber Zusammenhänge zwischen Herstellungsverfahren von Eisenpulvern und der Kristallhärte. (Relationship Between Methods for Production of Iron Powders and Hardness of the Sintered Bodies.) Walther Dawihl and Ursula Schmidt. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 117-119.

Hardness is greatly affected by the production method.

5B-16. Die heutigen Verfahren zur Herstellung von Eisenpulver, ihre Rohstoffgrundlagen und Wirtschaftlichkeit. (Modern Methods of Producing Iron Powders; Basic Raw Materials; and Economics.) Herbert Buchholtz. *Stahl und Eisen,* v. 69, Apr. 14, 1949, p. 247-256.

The most important methods and their technical and economic advantages and disadvantages. 15 ref.

5B-17. Electrolytic Production and Properties of Iron Powder. (In Russian.) L. L. Kuzmin and V. L. Kiseleva. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Mar. 1949, p. 311-318.

The production method was studied, with emphasis on the following factors: content of $FeSO_4 \cdot 7H_2O$, pH of solution, cathode current density, and temperature. On the basis of the results optimum conditions were established. 12 ref.

5B-18. Verbesserung der mechanischen

Eigenschaften von Sinterweicheisen durch Sauerstoffbehandlung. (Improving the Mechanical Properties of Sintered Soft Iron by Treatment with Oxygen.) H. Wiemer and R. Hanebuth. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 129-132.

Details of experimental work as applied to sintered bodies of different densities and produced from different Fe powders.

5B-19. Magnetic Properties of Iron Compacts in Relation to Sintering Temperature. Robert Steinitz. *Journal of Applied Physics,* v. 20, July 1949, p. 712-714.

The permeability of five different iron powders was shown to be independent of the origin of the powder, if the compacts were sintered at the same temperature. Results were compared with the theory of Polder and Van Santen and agreed very well, if the residual pores were assumed to be flat disks. Compared for identical densities, the permeability of different iron powders is appreciably higher if sintering is done at 1250-1350° C. and for 24 hours, instead of at 1150° C. for one hour. Coining after high-temperature sintering brings the permeability values back to the curve of the disk-shaped flat pores. The temperature effect, therefore, must be attributed to a change in pore shape.

5B-20. Les vitesses de réaction au voisinage des points de transformation magnétique. Application a la cémentation du Fer. (Rates of Reaction in the Neighborhood of Magnetic-Transformation Points. Application to Sintering of Iron.) H. Forestier and G. Nury. *Bulletin de la Société Chimique de France*, Mar.-Apr. 1949, p. D193-D195.

The sintering of metals and ferromagnetic alloys close to the Curie point. Results obtained confirmed the previous theory of the author that the ratio of the reaction reaches a maximum at the Curie point.

5B-21. Methods of Iron Powder Manufacture and Their Influence on Powder Properties. H. Bernstorff. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 93-102. Translated from the German.

Various methods of manufacturing iron powder used in Germany, including grinding, atomization, chemical reduction, and electrolytic methods. Relative size and shape of powders and their effects on physical properties of the product. 19 ref.

5B-22. Electrical Resistivity Measurements on Iron-Silicon Compacts Prepared by the Powder Metallurgy Procedure. Frank W. Glaser. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 475-480.

Values for the specific electrical resistivity of Fe-Si alloys containing 6-50% Si were determined. Electrical resistance varies with degree of diffusion of the alloys. Hot pressing and heat treating can be used to produce Fe-Si alloys in suitable forms. Nitrogen in the atmosphere has little effect upon electrical resistivity. 10 ref.

5B-23. Some Effects of Oxygen on the Performance of Iron Powder. Joseph J. Cordiano. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 21-28; discussion, p. 28-35.

From results of the experimental work, it appears that internal oxides in iron powders do not materially affect the mechanical properties of sintered iron compacts, but do strongly decrease the density of green and sintered compacts. In addition, volume and linear shrinkage increase with increasing internal oxide content.

5B-24. Electrolytic Iron Powder. [L. L. Kuzmin and V. L. Kiseleva.] *Chemical Age,* v. 61, Sept. 3, 1949, p. 320-322.

Previously abstracted from *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry). See item 5B-17, 1949.

5C—Nonferrous

5C-1 (Book). **Manufacture of Cemented Carbides.** T. A. Hood. 153 pages. 1947. Defence Research Laboratories, Dept. of Supply and Development, Commonwealth of Australia, Maribyrnong, Victoria, Australia. (Information Circular 12.)

The production of "starting materials", such as powdered carbides and powdered metals, from raw materials is briefly described. The manufacture of cemented carbide articles from the powdered constituents, which involves milling of the powders, the pressing of compacts, and their heat treatment is dealt with in detail. The various items of plant and equipment required such as ball-mills, furnaces, molds and presses, are described; and notes on design and materials of construction are given. This is followed by a series of tables of properties, an abstracted bibliography, and author and subject indices.

5C-2. Porous Metal in the Chemical Industry; Applications for Filtration, Aeration and Other Purposes. J. W. Lennox and G. Brewer. *Industrial Chemist and Chemical Manufacturer,* v. 25, Jan. 1949, p. 31-35.

Experiments with regular-shaped bronze particles, as well as applications.

5C-3. Tungsten Carbide-Free Hard Metals. R. Kieffer and F. Kolbl. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 4-17.

Possibility of developing the above; properties and structures of various hard materials which were considered as substitutes for WC. The superiority of solid solutions of two or more carbides over single-carbide systems is indicated. It is concluded that hard alloys containing no metal carbides are of limited value; but that WC can be replaced by metal carbides of the 4th, 5th, and 6th groups of the periodic system. TiC appears to be most suitable as a major constituent; and VC, CbC, and MoC as minor ones. Methods of production.

5C-4. Manufacture of Ductile Thorium. W. Espe. *Powder Metallurgy Bulletin,* v. 4, Jan. 1949, p. 17-18.

Production methods developed during the war in Germany. Powder-metallurgy techniques were exclusively employed.

5C-5. The Densification of Copper Powder Compacts in Hydrogen and in Vacuum. Charles B. Jordan and Pol Duwez. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 96-99.

Changes of density were studied as a function of temperature and time of sintering. Results are graphed and correlated mathematically.

5C-6. Sheath Working of Metal Powders. James R. Long and Earl T. Hayes. *U. S. Bureau of Mines,* Report of Investigations No. 4464, Feb. 1949, 13 pages.

Sheath rolling of green but unsintered powder-metal compacts, as well as rolling of loosely packed powder or mixtures of powders, was investigated. Excellent consolidation was realized, even when the powder was not packed into the sheaths very densely. Elimination of voids was excellent. The homogeneity of the sheath-rolled metal in comparison to pressed and sintered compacts was outstanding.

5C-7. Brass Powder Parts in Toys. *Iron Age,* v. 163, Mar. 24, 1949, p. 71.

5C-8. Porous Metal Bearings. A. J. Langhammer. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 119-123; discussion, p. 136-137.

Fabrication, advantages, applications, and the various alloys used.

5C-9. Moraine Durex-100 Engine Bearings. J. A. Lignian. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 124-130; discussion, p. 136-137.

The Durex-100 bearing is a steel-backed, lead-base, babbitt-lined bearing, in which the bearing surface is supported by, and bonded to, a spongy, metallic base. These bearings are of the precision, interchangeable type used in connecting rods and main bearings, and in full-round, split-type bushings for camshaft bushings. Fabrication procedure and structures of the layer and the underlying base metal. A mechanical mixture of pure Cu and Ni powders is applied to the steel base by sintering.

5C-10. Pure Platinum, of High Recrystallization Temperature, Produced by Powder Metallurgy. A. B. Middleton, L. B. Pfeil, and E. C. Rhodes. *Journal of the Institute of Metals,* v. 75, Mar. 1949, p. 595-608.

Previous work on powder metallurgy of Pt. Hitherto no essential difference has been noted between the physical properties of sintered and of melted and cast pure platinum. By sintering and hot working a fine powder compact, at a temperature considerably below its melting point, followed by severe cold drawing to wire, the fibrous structure of the wire is made to persist when heated at temperatures well above the recrystallization temperature of wire produced from melted, cast, and similarly worked material. The sintered wire also possesses greater resistance to elongation under tensile stress at high temperature and to intergranular corrosion than wire from melted and cast platinum recrystallized at the temperature of testing. 13 ref.

5C-11. Sintering Carbides by Means of Fugitive Binders. Lawrence S. Foster. *U. S. Atomic Energy Commission,* AECD-2464, Jan. 28, 1949, 35 pages.

Development of method for production of pure WC, CbC, and TaC having zero surface-connected porosity and nearly the theoretical density. This was done by grinding the carbides to a very fine particle size, admixing only a very small amount of binder (for example, less than 0.5% Co), sintering, and distilling off the binder metal by heat-

ing in vacuum. Ni and oxides of Co and Ni were also used as binders. Properties and structures of the products.

5C-12. Magnetische und elektrische Untersuchungen an gesinterten Karbonylnickelstäben. (Magnetic and Electrical Research on Sintered Carbonyl Nickel Bars.) Walther Gerlach, Jakoba von Rennenkampff, and Alexander Brill. *Zeitschrift fur Metallkunde,* v. 39, May 1938, p. 130-139.

Specific magnetization, hysteresis, remanence, coercive force, and demagnetization factor in the range between −195° C. and the Curie point. Also the density and the specific electrical resistance and the effect of oxygen, cooling rate, surface oxidation on these properties. Several X-ray analyses of the crystal structures.

5C-13. Duktile Sinterwerkstoffe. (Ductile Sintered Materials.) Otto Landgraf. *Metall,* v. 3, June 1949, p. 184-186.

Methods of production, with special emphasis on Ag-W and Cu-W alloys.

5C-14. Das Verhalten von gepressten Silberpulvern beim Sintern. (The Behavior of Pressed Silver Powders During Sintering.) Ernst Raub and Werner Plate. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 171-175.

The thermal expansion, electrical resistance, and structure were investigated over a range of sintering temperatures. These properties were correlated with the tendency of silver to cold welding. The effect of additions on the thermal expansion of pressed and sintered silver powder.

5C-15. The Control of Properties of Sintered Hard Metals. E. J. Sandford. *Alloy Metals Review,* v. 7, June 1949, p. 2-12.

How the properties of sintered hard metals are obtained and how they can be modified by alterations in manufacturing technique. Other topics discussed are choice of carbides, influence of cobalt content, use of binders other than cobalt, and influence of grain size.

5C-16. Fabrication of Titanium and Investigations of Titanium-Nickel Alloys in the Bureau of Mines Laboratories. J. R. Long. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 27-46; discussion p. 47-48.

See abstracts from *Metal Progress,* items 4C-36 and 5C-30, 1949.

5C-17. Oxidation of Titanium Carbide Base Ceramals Containing Molybdenum, Tungsten, and Cobalt. M. J. Whitman and A. J. Repko. *National Advisory Committee for Aeronautics,* Technical Note 1914, July 1949, 49 pages.

Oxidation-penetration characteristics of a number of the above at 1625, 1785, and 2000° F. Ceramals were composed of TiC and 5, 10, 20, and 30% Mo, W, or Co. Co ceramals were considered better than W ceramals in overall oxidation resistance and Mo ceramals were inferior to both

5C-18. Elevated-Temperature Properties of Several Titanium Carbide Base Ceramals. George C. Deutsch, Andrew J. Repko, and William G. Lidman. *National Advisory Committee for Aeronautics,* Technical Note 1915, July 1949, 47 pages.

Investigated from 1600 to 2400° F. to obtain information on bonding mechanisms. Compositions studied were TiC plus 5, 10, 20, and 30% by weight each of W, Mo and Co. Density, tensile strength, modulus-of-rupture, coefficient of linear expansion, and oxide-coating composition and structure were determined.

5C-19. Das Verhalten gepresster binärer Gemische von Gold- und Silberpulvern mit anderen Metallpulvern beim Sintern. (The Sintering Behavior of Compacted Binary Mixtures of Gold and Silver Powders With Other Metal Powders.) Ernst Raub and Werner Plate. *Zeitschrift für Metallkunde,* v. 40, June 1949, p. 206-214.

Sintering properties of Au-Ag, Au-Cu, Au-Ni, Ag-Zn, Ag-Cu, Ag-Pb, Ag-Fe, and Ag-Ni powder mixtures were studied. The relation between properties and structural changes caused by the sintering process.

5C-20. Metal Powder and Hard Particles Made Into Steel-Backed Bearings. Harry L. Strauss, Jr. *Metal Progress,* v. 56, Sept. 1949, p. 359.

Extension of hot pressing process described in March 1947 to pilot-plant manufacture of steel-backed bearings wherein the 'antifriction" material may be one of numerous combinations of powder metals, carbides, or borides. These bearings are required to operate at high temperature and extreme speeds without galling or binding. Method of manufacture.

5C-21. Metallographic Study of the Sintering Process. G. A. Geach and F. O. Jones. *Research,* v. 2, Oct. 1949, p. 493-494.

Technique and results obtained with Cu heated in hydrogen. Effects of varying time and temperature of sintering and diameter of the wire.

5C-22. A Process for Hot Pressing Beryllium Powder. A. U. Seybolt, R. M. Linsmayer, and J. P. Frandsen. *U. S. Atomic Energy Commission,* AECD 2679, Aug. 18, 1949, 23 pages.

Hot pressed powder compacts up to 12-in. diam. and 4 in. thick of practically theoretical density were made. Radiographic and metallographic examination show Be to be quite uniform and structurally dense. Tensile-test data indicate properties comparable to Be fabricated from castings.

5C-23. Some Aspects of the Production and Heat Treatment of Electrolytic Copper Powder. H. J. V. Tyrrell. *Journal of the Institute of Metals,* v. 76, Sept. 1949, p. 17-42.

Preparation from acid copper sulfate and acid sodium cupro-chloride electrolytes was studied on a laboratory scale. The powders prepared from the two electrolytes were quite different both in appearance and properties. Effects of heat treatment on properties were studied. The annealing atmosphere was of great importance in determining stability of the powder. It was found possible to stabilize such powders by coating the particles with a monolayer of stearate ions. Relationships between tensile strength of sintered compacts and annealing temperature, forming pressure, density, and change in density on sintering were investigated. 14 ref.

5C-24. Production of Platinum by Powder Metallurgy. A. B. Middleton, L. B. Pfeil, and E. C. Rhodes. *Engineering,* v. 168, Oct. 21, 1949, p. 431-433. Condensed from "Pure Platinum of High Recrystallisation Temperature, Produced by Powder Metallurgy".

Previously abstracted from *Journal of the Institute of Metals.*. See item 5C-10, 1949.

5C-25. The Pore Size of Hydrogen Reduced Tungsten Powder. B. Kopelman and C. C. Gregg. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 666-671.

Previously abstracted from *Metals Technology.* See item 5c-25, 1948.

5C-26. A Study of the Mechanism of Sintering of Metallic Particles. J. H. Dedrick and A. Gerds. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1042-1044.

Single layers of spherical copper particles were sintered under varying conditions of time and temperature in a dry hydrogen atmosphere. Analysis of the rate of interface contact between the particles shows metallic sintering to be a diffusion process. Heat of activation of self-diffusion of Cu was calculated.

5C-27. Molybdenum; Production, Properties and Applications. G. L. Miller. *Metal Industry,* v. 75, Nov. 11, 1949, p. 411-413.

Two methods for production of Mo ingots, in one case up to 250 lb. in weight. Both methods are based on powder metallurgy. Photomicrographs show typical microstructures of Mo processed in different ways.

5C-28. The Formation of Alloys by Diffusion in Powder Metallurgy. Pol Duwez. *Powder Metallurgy Bulletin,* v. 4, Oct. 1949, p. 144-156.

The homogenization of compacts made of Cu-Ni, Cu-Zn, and Cu-Sn was studied by X-ray diffraction and by recording the thermal expansion measurements. For the Cu-Ni compacts, the thermal expansion curve is similar to that of a pure metal during sintering. The Cu-Zn and Cu-Sn compacts exhibit abnormal expansions which are related to the presence of intermediate phases during diffusion. (To be concluded.)

5C-29. Sintered Products: Developments in Powder-Metallurgy; Porous-Metal De-Icer Panels. *Aircraft Production,* v. 11, Dec. 1949, p. 424-425.

System in which de-icing fluid is distributed at the leading edge through bars of porous metal. An 89-11 bronze is used. Other applications such as fuel filters are suggested. The powder is available in five particle-size ranges.

5C-30. The Consolidation of Titanium Powder by Sheath Rolling. J. R. Long. *Metal Progress,* v. 55, Feb. 1949, p. 191-192.

New method permits fabrication of an almost unlimited mass of metal into a single piece. Sheath-rolled titanium is said to be dense and sound, in contrast with the porous compact obtained by pressing and sintering. Mechanical properties of Ti produced by both methods.

SECTION VI

CORROSION

6A—General

6A-1. Oxide Films Formed on Metals and Binary Alloys. An Electron Diffraction Study. J. W. Hickman. *Metals Technology,* v. 15, Dec. 1948, TP 2483, 18 pages.

Results of study of films formed on a series of pure metals are summarized and data on 31 binary alloys (Ti-Ni, Ti-Cu, Zr-Cu, Zr-Co, Zr-Ni, Mo-W, Mo-Ni, Mo-Co, Mo-Cr, W-Ni, W-Cr, W-Cu, Si-Fe, Cr-Fe, Ni-Cr, Be-Cu, and Cu-Ni, of various percentage ratios). It is impossible to predict the oxide that will be formed on the basis of thermodynamic stabilities or ion sizes. An empirical table in graphical form shows sums of relative rates of formation and diffusion of the several ions based on the data. 27 ref.

6A-2. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering,* v. 55, Dec. 1948, p. 231-232, 234.

Part I of a symposium in which a representative group of construction materials is evaluated for services involving hydrochloric acid. Includes the following: "Stainless Steel", W. G. Renshaw; "Lead", Kempton H. Roll; "Rubber Lining", O. S. True; and "High-Silicon Irons", Walter A. Luce.

6A-3. Station Design and Material Composition As Factors in Boiler Corrosion. R. B. Donworth. *Paper Trade Journal,* v. 127, Dec. 30, 1948, p. 17-20.

The equipment in a modern power station is composed chiefly of two elements, Fe and Cu. Other elements including Zn, Cr, Mo, Ni, Mn, W, Co, Sn, P, Sb, As, Ag, and C are also present in smaller quantities. Shows physical relationship of materials and influence of design on both corrosion and erosion and the subsequent carrying of the products into the boiler.

6A-4. Plastic Coatings and Corrosion. C. G. Munger. *World Oil,* v. 128, Jan. 1949, p. 176-177, 180.

Vinyl chloride and vinyl chloride copolymer resins were evaluated as corrosion-preventive coatings. The studies are of especial value in the protection of tubular goods and tank structures.

6A-5. Zur Bedeckungstheorie der Passivität. (The Coating Theory of Passivity.) F. Halla and R. Weiner. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 27-32.

Attempt to show that W. J. Muller's experiments do not necessarily prove that the coating is uniformly thick over the entire area. 18 ref.

6A-6. Allgemeine Betrachtungen zur Passivität. (A General Discussion of Passivity.) K. Wickert. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 32-40.

The problem of the protective effect of pickling. Apparatus used to investigate anodic and cathodic passivation.

6A-7. Die Bedeckungstheorie der Passivität der Metalle. (The Coating Theory of the Passivity of Metals.) III. V. Cupr. *Korrosion and Metallschutz,* v. 21, Mar.-Apr. 1945, p. 43-44.

W. J. Muller's derivation of an equation for the above is based on Faraday's Law, and rejection of the former theory would be premature.

6A-8. Uber die Spannungs- und Temperatureabhängigkeit der Spannungskorrosion. (The Effect of Stress and Temperature on Stress Corrosion.) Gunter Wassermann. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 66-71.

The metals investigated were ferritic and austenitic steels; Al-Cu, Al-Mg, Al-Zn-Mg, and Mg-Al-Zn alloys; and brass.

6A-9. Examen systématique de l'inhibition de la corrosion. (Systematic Investigation of Corrosion Inhibition.) H. C. J. de Decker. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 226-231.

The relationship among concentration of inhibitor, time of contact, composition of material, and nature of medium. Different methods of measurements and interpretation of data.

6A-10. Observations sur la tenue a la corrosion des cables électriques en aluminium-acier déposés apres 15 a 30 ans d'usage. (Observations Concerning the Corrosion of Aluminum Cable With A Galvanized Steel Core Used for High-Tension Lines After 15 to 30 Years of Service.) J. Hérenguel. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 242-244.

Results indicate that life should easily exceed 50 years, without alteration of basic properties.

6A-11. Variation of Standard Electrode Potentials With Temperature. M. H. Everdell. *Nature,* v. 162, Dec. 25, 1948, p. 995-996.

The desirability in corrosion studies of being able to directly compare potentials measured at different temperatures. A theoretical analysis indicates that the potential of the standard hydrogen electrode or any other electrode does vary with temperature.

6A-12. A Study of the Corrosion Resistance of High-Alloy Steels to an Industrial Atmosphere. H. T. Shirley and J. E. Truman. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 367-375.

Tests designed to study the effects of composition and surface finish on behavior of steels when exposed for long periods to several industrial atmospheres, without the cleansing treatment normally recommended. The series included some 450 samples, covering 22 steels and 5 nonferrous materials, all in sheet form. The three types of surface finish tested were pickled, emeried, and mirror-polished. 15 ref.

6A-13. Galvanic Corrosion of Metals in Salt Water. *Metal Finishing,* v. 47, Jan. 1949, p. 73.

Table shows relative activity of 29 different commercial alloys.

6A-14 (Book). **Directory of the American Co-Ordinating Committee on Corrosion.** 62 pages. National Association of Corrosion Engineers, 905 Southern Standard Bldg., Houston, Tex. $2.00.

Names, addresses, and fields of special endeavor of many of the principal corrosion workers in the U. S. and Canada. A cross-index makes it possible to find the name and address of workers in specific phases of corrosion. Consists of four parts: a subject index; an alphabetical index of individuals; an alphabetical index of organizations and companies; and a numerical serial number listing of individuals.

6A-15. A Unified Mechanism of Passivity and Inhibition. R. B. Mears. *Journal of the Electrochemical Society,* v. 95, Jan. 1949, p. 1-10.

A mechanism based on the behavior of local elements in metal surfaces is developed. Passivity may be achieved either by reduction of open-circuit potential differences between local anodes and cathodes, increased anodic polarization, increased cathodic polarization, or a combination of these factors. 19 ref.

6A-16. Corrosion and Incrustation of Well Screens. G. F. Briggs. *Journal, American Water Works Association,* v. 41, Jan. 1949, p. 67-74.

Definitions; forms of corrosion; conditions favorable to corrosion; anti-corrosion measures; forms and causes of incrustation; overcoming incrustation.

6A-17. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering,* v. 56, Jan. 1949, p. 231-232, 234, 236, 238, 240.

Part II of a symposium. Includes "Carbon and Graphite," W. M. Gaylord; "Tantalum," Leonard R. Scribner; "Chlorimet," Walter A. Luce; "Iron and Steel," A. W. Spitz; and "Worthite," W. E. Pratt.

6A-18. An Investigation into the Corrosion of Zinc and Zinc-Coated Steel in Hot Waters. P. T. Gilbert. *Sheet Metal Industries*, v. 25, Oct. 1948, p. 2003-2012; Nov. 1948, p. 2243-2254; Dec. 1948, p. 2441-2448, 2460.

At temperatures up to 85° C., corrosion is usually more highly localized in hot water than in cold. Experimental work was undertaken in an attempt to confirm the theory that the usual electrochemical relationship between zinc and steel is reversed in hot water and to determine the conditions under which this occurs. A theory of the phenomenon is formulated. 24 ref.

6A-19. The Use of Inhibitors for Controlling Metal Corrosion. Part II. Types of Inhibitors. G. T. Colegate. *Metallurgia,* v. 39, Jan. 1949, p. 149-151.

Use of inhibitors in aqueous media for preventing galvanic action between dissimilar metals in contact.

6A-20. Galvanic Corrosion and Its Practical Significance. G. T. Colegate. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 183-192.

The fundamentals of corrosion. Conclusions are applied to practical conditions with special reference to Cu, Al, Fe, and Mg alloys. Methods of corrosion prevention. 15 ref.

6A-21. Apercu succinct. Des expériences atmosphériques de longue durée de la Commission suédoise de Corrosion. (A Brief Report. Long-Time Atmospheric Tests Performed by Swedish Commission on Corrosion.) Eva Palmaer. *Métaux & Corrosion,* v. 23, Dec. 1948, p. 285-290.

Method used and results obtained. Emphasis on testing of specimens coated or treated with anticorrosive agents. Influence of different factors involved.

6A-22. Stress-Corrosion: A Review of the Literature. K. R. Hanna. *Division of Aeronautics, Council for Scientific and Industrial Research, Commonwealth of Australia* (Melbourne), Report SM. 120, Oct. 1948, 19 pages.

Nature of stresses, effects of stress on electrode potentials of metals, alloy characteristics influencing stress-corrosion, methods of preventing or minimizing stress-corrosion, and methods of testing.

6A-23. Pulse Polarization Studies of Corrosion Rates. Glenn A. Marsh and Hugh J. McDonald. "Pittsburgh International Conference on Surface Reactions", 1948, p. 1-5.

A metal specimen is polarized to a high cathodic potential over a brief time interval, and the resulting polarization potential and the depolarization which follows are recorded on a high-speed strip chart. Quantitative data obtained for steel in various organic-liquid solutions. A mechanism to account for the linear relationship of polarization potentials and corrosion rates. 14 ref.

6A-24. Theory and Technique of Measuring Metal Dissolution Rates. Cecil V. King. "Pittsburgh International Conference on Surface Reactions", 1948, p. 5-9.

The diffusion-layer theory with emphasis on modern aspects, and the action of depolarizers on metals in acid solutions, and of other oxidizing agents. Potential of reversible oxidation-reduction systems was altered systematically until the chemical reaction is no longer rapid and the observed dissolution rate no longer diffusion-controlled. 15 ref.

6A-25. Application of the Electron Microscope in Corrosion Studies. E. M. Mahla and N. A. Nielsen. "Pittsburgh International Conference on Surface Reactions", 1948, p. 60-66.

Application to study of intergranular corrosion of stainless steel; to effect of grain orientation on corrosion; to surface film studies; and to miscellaneous replica studies of corrosion.

6A-26. The Mechanism of the Formation of Films on Metals. U. R. Evans. "Pittsburgh International Conference on Surface Reactions", 1948, p. 71-76.

Previously abstracted from *Corrosion and Material Protection.* See item 6a-97, 1948.

6A-27. Reactions of Metals and Alloys With Oxygen, Sulphur, and Halogens at High Temperatures. Carl Wagner. "Pittsburgh International Conference on Surface Reactions", p. 77-82.

Previously abstracted from *Corrosion and Material Protection.* See item 6a-126, 1948.

6A-28. A Study of the Difference Effect. Michael A. Streicher. "Pittsburgh International Conference on Surface Reactions", 1948, p. 105-113.

When a metal is made an electrode in an aggressive electrolyte, there may be suppression of attack when the specimen is made a cathode, or rate of dissolution may be increased by making it an anode. However, the rate of normal dissolution may be reduced by the external anodic current. This phenomenon is known as the "difference effect". Effect for Al in NaOH solutions. Extensive theoretical discussion and practical significance. 37 ref.

6A-29. Some Recent Contributions of a British Corrosion Research Group. W. H. J. Vernon. "Pittsburgh International Conference on Surface Reactions", 1948, p. 135-141.

Several recent improvements in corrosion-testing equipment and procedures include: submerged-corrosion test apparatus; electrical methods for study of protective systems; atmospheric corrosion testing; surface-film studies; inhibitor studies; and studies of microbiological soil corrosion. 19 ref.

6A-30. Investigations of Gas-Metal Reactions by Reflection Electron Diffraction. J. W. Hickman. "Pittsburgh International Conference on Surface Reactions", 1948, p. 142-156.

Types of information that may be obtained by using this technique: structural changes that occur during oxidation at constant temperatures; reversible and irreversible transitions that occur when oxide films are heated and cooled; reduction of one oxide to another; changes in oxide-crystal size during

oxidation at constant temperature; irreversible solid-phase reactions that occur when oxide films on binary alloys are heated in vacuo; changes in oxide-crystal size as temperature is increased at constant film thickness; oxide-film orientation caused by substrata and growth effects; existence regions of oxide films as a function of time and temperature of oxidation; and relative tendencies of the metals in binary alloys of Mo, Co, W, Ni, and Cr to reach the surface and form oxides. 18 ref.

6A-31. Theoretical and Experimental Investigations About Conjugated Formation of Several Layers in Dry Corrosion. (In French.) G. Valensi. "Pittsburgh International Conference on Surface Reactions", 1948, p. 156-165.

Theoretical analysis of the mechanism of multi-layer formation in dry corrosion of metals having two oxides. Presentation of experimental results for oxidation of Cu at elevated temperature. It is possible to calculate an overall constant of attack and also the composition of the double layer. Presence of an initial oxide film or of occluded gases interferes with the above results. 28 ref.

6A-32. Influence of the Condition of Iron and Copper on Oxidation at High Temperatures. Jacques Benard. "Pittsburgh International Conference on Surface Reactions," 1948, p. 167-172.

Previously abstracted from *Revue de Métallurgie*. See item 6c-30, 1948.

6A-33. The Breakdown of Oxide Films in Acid Vapours. W. Feitknecht. "Pittsburgh International Conference on Surface Reactions", 1948, p. 212-221.

The attack of HCl vapor on Zn, Cd, Ni, Fe, and Cu and the chemical and thermochemical properties of the corrosion products. Samples prepared in different ways were hung in atmospheres of known HCl content. The form of the corrosion products was determined microscopically and the rate of attack was measured by weighing. First stages of the breakdown of the primary oxide film on Zn and Cu were studied by means of the electron microscope. 27 ref.

6A-34. Hydrochloric Acid Versus Construction Materials. *Chemical Engineering*, v. 56, Feb. 1949, p. 243-244, 246, 248, 250, 252, 254.

Part III of a symposium in which a representative group of construction materials are evaluated for services involving hydrochloric acid: "Precious Metals", E. F. Rosenblatt; "Silicones", J. A. McHard and Leon Vanvolkinburg; "Glass Pipe", E. K. Lofberg; "Durimet-20", Walter A. Luce; and "Nickel and Nickel Alloys", W. Z. Friend.

6A-35. Stopping Costly Corrosion With Good Design. *Modern Industry*, v. 17, Feb. 15, 1949, p. 50-53.

A general discussion with practical recommendations.

6A-36. Corrosion of Boiler Generating Tubes. R. L. Rees and E. A. Howes. *Combustion*, v. 20, Feb. 1949, p. 49-51.

Corrosion problems encountered in two British electric generating stations. Corrosion products include considerable quantities of copper.

6A-37. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*. v. 41, Mar. 1949, p. 101A-102A.

Recommended procedures for pilot-plant corrosion testing.

6A-38. What Causes Localized Corrosion? *Steel*, v. 124, Mar. 14, 1949, p. 86-89, 128.

Localized corrosion is often attributed to the presence of impurities. A number of other causes are said to be of far more practical importance. These include metallurgical factors, surface roughness, differential strain, and others.

6A-39. L'épitaxie dans les phénomenes de corrosion. ("Epitaxis" in the Phenomena of Corrosion.) M. Capdecomme. *Journées des Etats de Surface*, 1946, p. 247-249; discussion, p. 249-250.

"Epitaxis" refers to the mechanism by which a continuous crystalline structure, on an atomic scale, is formed joining the base metal and a surface deposit, which may be another metal or an oxide or corrosion product. Results of an experimental study show the importance of this mechanism in metal corrosion, and in mechanical and electrolytic polishing.

6A-40. Corrosion, passivité et passivation au point de vue thermodynamique. (Corrosion, Passivity, and Passivation From the Thermodynamic Point of View.) M. Pourbaix. *Journées des Etats de Surface*, 1946, p. 251-265.

See abstract from *Métaux & Corrosion*, item 6-204, 1947.

6A-41. A Cooperative Approach to Electrolysis Problems. Russell M. Lawall. *Corrosion*, v. 5, Mar. 1949, p. 79-84; discussion, p. 84-85.

Case histories of stray-current and galvanic corrosion caused by street-railway and other electrical distribution systems in the Detroit area.

6A-42. Influence of Residual Stress on Chemical Behaviour. U. R. Evans. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 291-310; discussion, p. 463-484.

Experiments on oxide-film transfer indicate that a state of stress or strain must have existed during attachment to the metal. Effects of residual stresses on distribution of attack by salt solution; the mechanisms of stress-corrosion cracking and thermal stress relief; effects of compressional surface stresses applied by peening; and use of paints heavily pigmented with metallic Zn to minimize corrosion fatigue and cracking. 73 ref.

6A-43. Chemical Manifestations of Internal Stress. F. H. Keating. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 311-331; discussion, p. 463-484.

The combined effect of internal stress and a corrosive environment and the significance of stress-corrosion cracking. Stress-corrosion cracking of the common industrial alloys and some examples of cracking in service. A tentative explanation of the mechanism. 98 ref.

6A-44. Concerning Double Ionic Layers on Oxidized Metals. (In Russian.) A. A. Rakov, T. I. Borisova, and B. V. Ershler. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Nov. 1948, p. 1390-1396.

The relationship of the capacity of the double layer on a polished and etched nickel electrode to the potential and to the amount of adsorbed oxygen was determined. Decrease of the capacity during adsorption is explained by assuming a decrease in electron concentration in the external layer of the metal lattice which contains embedded oxygen atoms. 11 ref.

6A-45. (Book.) **Pittsburgh International Conference on Surface Reactions.** 236 pages. 1948. Corrosion Publishing Co., 1117 Wolfendale St., Pittsburgh. $6.50 to those attending the conference; $10.00 to others.

Twenty-eight papers reproduced from typed copy. The majority deal with surface reactions on metals, in theory and in practice; surface catalysis, adsorption and desorption, and theory of film optics are also dealt with. Individual papers are abstracted separately.

6A-46. "Vapor Phase Inhibitor" Spells Product Protection. Newell Farrar. *Western Metals,* v. 7, Mar. 1949, p. 35-36.

Rust and corrosion inhibitor wrapping that eliminates grease, requires no special handling or application system, and is non-toxic yet offers full protection for periods up to five years for ferrous and aluminum stock or products.

6A-47. Corrosion of Metals; Microbiological Factors in Underground Corrosion. W. H. J. Vernon. *Chemical Age,* v. 60, Mar. 5, 1949, p. 355-357.

Summary of lecture before meeting of the Royal Society of Arts, London, Feb. 21, 1949.

6A-48. Some Aspects of Packaging in Metal Containers. R. K. Sanders. *Chemistry & Industry,* Mar. 5, 1949, p. 151-155.

Leakage, mechanical strength, corrosion, application of coatings, and design for ease of opening.

6A-49. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, Apr. 1949, p. 103A-104A.

Factors of time of exposure and temperature in pilot-plant corrosion testing.

6A-50. Verhalten "kohlenoxydfester" Werkstoffe gegenuber Wassergas bei extremen Bedingungen. (Behavior of "Carbon Oxide" Resistant Materials in Contact With Water Gas Under Extreme Conditions.) K. H. Ziesecke. *Chemie-Ingenieur-Technik,* v. 21, Jan. 1949, p. 15-18.

Twenty chromium steels and 6 nonferrous metals were studied at 1000 atm. and temperatures of 300-450° C. Industrial applications and experimental furnace design.

6A-51. Corrosion, Passivity and Passivation From the Thermodynamic Point of View. M. Pourbaix. *Corrosion,* v. 5, Apr. 1949, p. 121-133.

Translated from "Journées des Etats du Surface." 1946. See items 6A-40, 1949, and 6-204, 1947. 15 ref.

6A-52. Intorno all'interpretazione del processo di corrosione per cavitazione. (Theory of the Stress-Corrosion Process.) Gernando Petracchi. *La Metallurgia Italiana,* v. 41, Jan.-Feb. 1949, p. 1-6.

Principal theories given in the literature. According to the author's theory, by the action of mechanical stresses, the corrosive effects of local microcells are produced or increased. Experimental results on ferrous and nonferrous metals show the importance of very weak currents used for cathodic protection or in anodic corrosion. 17 ref.

6A-53. Fatty Acids Versus Construction Materials. *Chemical Engineering,* v. 56, Apr. 1949, p. 217-218.

Part I of a symposium in which

a representative group of construction materials is evaluated for services involving fatty acids. Includes: "Glass-Lined Steel", by S. W. McCann; "Carbon and Graphite", by W. W. Palmquist; and "Stainless Steel", by Grant L. Snair.

6A-54. Determination of Corrosion of Wire Test Specimens Under Constant Tensile Stress. (In Russian.) N. D. Tomashov and V. A. Titov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 48-53.

Specially developed apparatus for corrosion testing in synthetic brines. Typical test data on steel wire.

6A-55. Le rayonnement ultraviolet pendant l'oxydation anodique des métaux et des alliages. (Ultraviolet Radiation During Anodic Oxidation of Metals and Alloys.) R. Domansky. *Collection of Czechoslovak Chemical Communications,* v. 14, No. 1-2, 1949, p. 1-9.

Investigated on 14 different metals and on a series of alloys. Results indicate the presence of ultraviolet radiation during the anodic oxidation of Ta, Al, Si, Mg, Zn, and Cd and of alloys having these elements as base metals. Cu, Sn, Pb, Cr, Fe, Ni, Co, Pt, and their alloys did not show the above phenomenon.

6A-56. The Promotion and Acceleration of Metallic Corrosion by Micro-Organisms. T. Howard Rogers. *Engineer,* v. 187, Apr. 15, 1949, p. 424-425; discussion, p. 404.

A condensation.

6A-57. Crude Still Overhead System Corrosion. A. F. Blumer. *Corrosion,* v. 5, May 1949, p. 135-145; discussion, p. 146-147.

Various types of corrosion occurring in the above. Recommendations for combatting general corrosion by sulfide removal and neutralization of acidic constituents, as well as by proper selection of materials. Corrosion-test data obtained with a variety of metals in different locations. Dezincification, stress-corrosion, and corrosion fatigue. Effects of vibrations caused by machinery in operation. Conclusions.

6A-58. Station Design and Material Composition as Factors in Boiler Corrosion. R. B. Donworth. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 897-904; discussion, p. 905-906.

Previously abstracted from preprint. See item 6a-59, 1948.

6A-59. Zur Topochemie und Kinetik der Korrosionsvorgänge. (The Topochemistry and Kinetics of Corrosion Phenomena.) W. Machu. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 1-7.

Fundamentals of corrosion processes, showing that the most important factors of corrosion protection and rate of corrosion are stability and area of the cathode surface. A rule for change of cathode surface with time, according to which the rate of corrosion of a coated metal is always proportional to the effective cathode surface, not to the dissolving surface of the anode.

6A-60. Corrosion Resistance of Stainless, Monel and Nickel Castings. Norman S. Mott. *Materials & Methods,* v. 29, May 1949, p. 79, 81.

Resistance to common chemicals.

6A-61. Radioactive Tracers Used in Corrosion Studies. C. G. Bacon. *General Electric Review,* v. 52, May 1949, p. 7-9.

Procedure used at G. E.

6A-62. Investigation of Electrode Reactions by the Method of Charging-Curves and With the Aid of Alternating Currents. B. Ershler. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 269-277; discussion, p. 298-302.

Method and results obtained by its use with respect to: kinetics of the formation of adsorbed layers of oxygen and hydrogen on metals and of the dissolution of metals; and of the mechanism of anodic dissolution and passivation of platinum. 21 ref.

6A-63. The Use of Silver-Silver Chloride Reference Electrodes in Dilute Solutions. P. T. Gilbert. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 320-325; discussion, p. 325-328.

The Ag/AgCl electrode is suitable for use in corrosion work at temperatures up to at least 85° C. and in dilute solutions containing as little as 10 p.p.m. chloride. Desirability in corrosion studies of being able to compare directly potentials measured at different temperatures. Basis on which such comparisons may be possible.

6A-64. Corrosion Problems of the Automotive Engineer. F. L. LaQue and E. J. Hergenroether. *Society of Automotive Engineers,* Preprint No. 337, 1949, 24 pages.

Problem at temperatures not far above atmospheric and only as it occurs after manufacture has been completed. This leaves out corrosion of valves by hot exhaust gases, corrosion in the shop, etc. 23 ref.

6A-65. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, June 1949, p. 97A-98A.

Large increase in university research and teaching in the field of corrosion during recent years.

6A-66. Influence de l'humidité relative et de l'état de surface sur la corrosion de l'acier a faible teneur en carbone et du zinc. (Influence of the Relative Humidity and Surface Condition on the Corrosion of Low-Carbon Steels and Zinc.) Fielding Ogburn, Elmer R. Weaver, and William Blum. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 77-84.

Results of experiments using a constant-humidity chamber. Recommendations for minimizing such corrosion.

6A-67. Ein Verfahren zur Prufung des Korrosionswiderstandes unter veränderlicher Biegespannung. (A Method of Testing Corrosion Resistance Under Variable Bending Stress.) H. J. Seemann. *Metalloberfläche,* v. 3, sec. A, Apr. 1949, p. 85-86.

Simple setup.

6A-68. Chemical Aspects of Underground Corrosion and Corrosion Prevention. I. A. Denison. *American Gas Association, Proceedings,* 1948, p. 517-533.

Behavior of various ferrous and nonferrous metals and alloys underground with respect to both environment and composition of material. Influence of oxygen, soil reaction, soluble salts, and CO_2 on ferrous metals. 21 ref.

6A-69. Why Metals Corrode. Herbert H. Uhlig. *Corrosion,* v. 5, June 1949, p. 169-174.

Contact potentials, single electrode potentials, types of cells, corrosion tendencies of metals, corrosion and hydrogen overvoltage, depolarization, action of bacteria, effect of oxygen concentration, surface corrosion products, and corrosion control. 12 ref.

6A-70. Erosion-Corrosion of Metals and Alloys. M. G. Fontana and W. A. Luce. *Corrosion,* v. 5, June 1949, p. 189-193.

High velocity tests on steel, cupro-nickel, and lead which are said to be more reliable than conventional test methods for predicting performance of actual equipment.

6A-71. Corrosion of Telephone Outside Plant Material. K. C. Compton and A. Mendizza. *Corrosion,* v. 5, June 1949, p. 194-197.

Problems resulting and methods of meeting them. Materials include hot-dip-galvanized iron and steel, aluminum, and copper. 10 ref.

6A-72. Verhalten von metallischen Werkstoffen gegenuber sehr verdunnten, wässrigen Lösungen. (Behavior of Metals in Very Dilute Aqueous Solutions.) II. L. W. Haase. *Archiv fur Metallkunde,* v. 3, Mar. 1949, p. 96-99.

Tests showed that the differences in the behavior of the various metals, including the noble metals, depend largely, if not entirely, on the chemical behavior and structures of the oxidation products. Relationship of oxygen concentration to the position of the metal in the electrochemical series; and effect of the reactions of the corrosion products with alkalies on corrosion resistance.

6A-73. Uber die unterschiefliche Bewertung der Angriffskraft von Wässern. (Concerning Different Evaluations of the Corrosiveness of Water.) L. W. Haase. *Archiv fur Metallkunde,* v. 3, Mar. 1949, p. 114-117.

The various factors that determine the corrosiveness of bicarbonate-containing waters on ferrous and nonferrous metals.

6A-74. The Analysis of Corrosion-Time Curves. F. A. Champion and M. Whyte. *Journal of the Institute of Metals,* v. 75, May 1949, p. 737-740.

Empirical corrosion-time curves usually conform to one of four typical equations: rectilinear, parabolic, logarithmic, and exponential. Method for accurate fitting of data to the logarithmic curve, which is particularly useful for relatively low rates of oxidation or corrosion.

6A-75. Fatty Acids Versus Construction Materials. *Chemical Engineering,* v. 56, June 1949, p. 243-244.

Part III of a symposium in which a representative group of construction materials is evaluated for services involving fatty acids. Consists of "High-Silicon Irons", Walter A. Luce; and "Aluminum", Ellis D. Verink, Jr.

6A-76. High Temperature Corrosion of Metals. Andrew Dravieks and Hugh J. McDonald. *Industrial Gas,* v. 27, June 1949, p. 6. A condensation.

Problems of chemical attack of gases taking place in gas turbines, jet propulsion motors.

6A-77. Marine Corrosion Findings at Kure Beach Reviewed for Editors. *Chemical and Engineering News,* v. 27, June 27, 1949, p. 1867.

Accomplishments disclosed to professional and trade paper editors during a tour of the above experimental facilities. Large-scale adoption of Mg anodes for metal under-

water dock facilities, complete absence of corrosion attack on titanium, and the discovery that permanent immersion of part of steel test strips greatly reduces corrosion rates as compared to strip not in continuous contact with water were three of the highlights.

6A-78. Kure Beach Metal Corrosion Tests Corroborate Existing Theories Under Actual Service Conditions. E. C. Kreutzberg. *Steel,* v. 124, June 27, 1949, p. 88, 91.

Results of exposure tests to sea water and marine atmospheres. Special attention is given to various steel alloys.

6A-79. Kinetic and Structural Factors Involved in Oxidation of Metals. Earl A. Gulbransen. *Industrial and Engineering Chemistry,* v. 41, July 1949, p. 1385-1391.

Methods used in fundamental study of the above, and results of rate studies on oxidation of Mo, Fe, W, Al, and Mg. The role of the secondary structure of the oxide film is emphasized. 23 ref.

6A-80. Foiled by Aluminum. *Industrial and Engineering Chemistry,* v. 41, July 1949, p. 7A, 10A.

Work on corrosion resistant metals for sprinkler irrigation piping. Use of 63S-T6 and 61S-T6 Al alloys proved most satisfactory, although there are a few areas where galvanic corrosion is a problem. Use of sacrificial anodes for the latter is being studied.

6A-81. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, July 1949, p. 63A-64A.

Some of the equipment and procedures being used in a research program on corrosion by liquids at elevated temperatures and pressures started last fall at Ohio State University under sponsorship of Alloy Casting Institute.

6A-82. Corrosion Inhibitors in Recirculating Water Systems. Marc Darrin. *Canadian Chemistry and Process Industries,* v. 33, June 1949, p. 512-516.

Inhibitors which function through anodic polarization. Many types of inhibition and a variety of practical applications are illustrated. 16 ref.

6A-83. Sulfur, Dew Point and Boiler Availability. Stephen Juhasz. *Combustion,* v. 20, June 1949, p. 55-58. Translated and condensed from *Teknisk Tidskrift* (Sweden), Jan. 22, 1949.

Sulfur content of fuel and flue gas is discussed in relation to deposits and corrosion of boiler and superheater surfaces. Problems of dew-point measurement, and a dew-point meter developed by the author. The economics of corrosion resisting materials and means of reducing corrosion difficulties.

6A-84. Corrosion Guide for Fasteners. *Product Engineering,* v. 20, July 1949, p. 161.

Chart evaluating corrosion resistance of materials used for screws, bolts, studs, and other fasteners.

6A-85. Corrosion Research in the Navy. Julius J. Harwood and Fred Schulman. *Corrosion,* v. 5, July 1949, p. 203-217.

Types of corrosion, methods of control, passivity and film formation, inhibitors and passivators, and high-temperature oxidation. 18 ref.

6A-86. High Temperature Corrosion of Metals. Andrew Dravnieks and Hugh J. McDonald. *Corrosion,* v. 5, July 1949, p. 227-233.

Problems of chemical attack by gases. Characteristics which play an important role include volatility of reaction products, adherence of scale to metal, relative thermal expansion and specific volume of metal scale. Other developments include effects of pressure, rate of flow, presence of foreign substances in the gas phase, surface conditions of the metal, and variations in temperature on the corrosion reaction. 52 ref.

6A-87. Korrosion. (Corrosion.) R. Ergang, G. Masing, G. Wassermann, and W. Wiederholt. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 257-281.

Reviews German literature for 1939-46. Separate sections deal with theory of corrosion (Ergang and Masing); stress corrosion (Wassermann); and corrosion testing (Wiederholt). 143 ref.

6A-88. Corrosion of Metals Under Lacquer Films and Electrochemical Methods of Investigation of Protective Properties of Lacquer Coatings. (In Russian.) N. D. Tomashov, V. S. Kiselev, and M. M. Gol'dberg. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Mar.-Apr. 1949, p. 152-163.

Basic laws of the above corrosion process. On the basis of the results, an electrochemical method of investigation is proposed. 17 ref.

6A-89. Sparbeizen. (Inhibitors.) *Metalloberfläche,* v. 3, June 1949, p. A125.

Preparation of some corrosion inhibitors said to be especially effective. Full details necessary to prepare these mixtures.

6A-90. Focus on Materials and Design to Stop Corrosion. *SAE Journal,* v. 57, July 1949, p. 60-61, 64.

Based on "Corrosion Problems of the Automotive Engineer" by F. L. LaQue and E. L. Hergenroether; "Corrosion of Electroplated Steel in Automotive Applications", by H. A. Pray; and "Service Tests Solve Aluminum Cylinder Head Corrosion Problems", by M. W. Daugherty and R. F. Koenig; also accompanying discussion. (Individual papers were previously abstracted from preprints), items 6A-64, 6B-92 and 6D-21, 1949.

6A-91. Joint Cathodic Protection Systems. *Pipe Line News,* July 1949, p. 16-18.

Reprint of a bulletin prepared by the Correlating Committee on Cathodic Protection.

6A-92. Britain's Combat With Corrosion. Wilfred F. Coxon. *Metal Progress,* v. 56, July 1949, p. 79-80.

Work of corrosion section of Britain's Chemical Research Laboratory on a variety of corrosion problems during the war.

6A-93. Sur quelques aspects des réactions entre une phase solide et une phase liquide ou gazeuse. (Certain Aspects of Reactions Between a Solid Phase and a Liquid or Gaseous Phase.) M. F. Trombe. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D213-D217.

The importance, from the practical point of view, of the ratio between the volume of solid products which may exist in the initial and final steps of a reaction. Depending on the value of this ratio, that is above or below unity, the solid phase formed protects or does not protect the initial phase. Application of this theory to oxidation of metals, to the attack of silica on aluminum, and in general to the protection of metals by oxide films.

6A-94. Marine Corrosion Tests Show Practical Results. George Weber. *Oil and Gas Journal,* v. 48, July 28, 1949, p. 236-237, 334.

Facilities and research work at Kure Beach, N. C., maintained jointly by International Nickel and Dow Chemical Companies. Use of Mg and Zn anodes for cathodic protection.

6A-95. Automotive Corrosion Clinic, *SAE Journal,* v. 57, Aug. 1949, p. 29-37. Based on "Corrosion Problems of the Automotive Engineer", F. L. LaQue and E. J. Hergenroether; "Corrosion of Electroplated Steel in Automotive Applications," H. A. Pray; and "Service Tests Solve Aluminum Cylinder Head Corrosion Problems", M. W. Daugherty and R. F. Koenig; also accompanying discussion.

Topics covered are: body-steel, engine-cylinder, cylinder-liner, muffler, and tailpipe corrosion. (LaQue and Hergenroether); corrosion of electroplated steel (Pray); cause of Al cylinder-head corrosion (discussion by D. H. Green), and remedy for the latter (Daugherty and Koenig). Papers were previously abstracted from *Society of Automotive Engineers,* Preprints, 1949. Items 6A-64, 6B-92, 1949.

6A-96. Procedures Outlined for Cathodic Protection Minimum Current Data Experiments. A. V. Smith. *Corrosion,* v. 5, Aug. 1949, p. xi.

Questionnaire failed to provide satisfactory information concerning minimum currents necessary for cathodic protection. Hence an outline of proposed experiments for determining these currents is presented. Details of methods will be planned by a subcommittee. Assistance in carrying out the experiments will be solicited.

6A-97. The Pulse Polarizer in Corrosion Technology. Hugh J. McDonald and Glenn A. Marsh. *Corrosion,* v. 5, Aug. 1949, p. 254-260.

Instrument and its present and potential uses in study of corrosion and electrochemistry in general. It consists essentially of a high-voltage d. c. source, a pulse-discharge mechanism, a sensitive polarization detector, and a high-speed strip-chart recorder. A high-voltage condenser is discharged across a cell and the potential of the electrode, (which may be the metal whose corrosion rate is desired) is measured against a standard reference electrode. Applications to the study of corrosion inhibitors, to choice of a metal for use in a particular environment, to alloy identification, and to choice of a stress-corrosion inhibitor. For certain corrosion reactions under cathodic control, data obtained may be used to quantitatively predict corrosion rates. 15 ref.

6A-98. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, Aug. 1949, p. 77A-78A.

Results of tests on CF-8 and titanium in HNO_3 at high temperatures and pressures. CF-8 is the Al-

loy Casting Institute's designation for the 18-8S type alloy.

6A-99. Testing Station a Valuable Source of Corrosion Data. *Machinery*, v. 55, Aug. 1949, p. 170.

Corrosion-testing station at Kure Beach. N. C.

6A-100. (Book) **Cathodic Protection—A Symposium.** 203 pages. 1949. National Assoc. of Corrosion Engineers, Houston, Tex. $8.00 ($6.00 to members of NACE or Electrochemical Society.)

Consists of 23 papers given in Dec. 1947, in Pittsburgh. They provide information on the state of development of the basic principles of cathodic protection and on their application to the control of corrosion.

6A-101. Effects of Internal Stresses. *Metal Progress*, v. 56, Aug. 1949, p. 242-244, 250, 252, 254.

Reviews last section of "Symposium on Internal Stresses in Metals and Alloys", Institute of Metals, London. See item 27a-142, 1948.

6A-102. Surface Reactions of Metals; Effect on Wear, Friction, Lubrication and Finishing. G. Tolley. *Metal Industry*, v. 75, July 22, 1949, p. 68-70, 73; July 29, 1949, p. 89-91; Aug. 5, 1949, p. 112-113.

Surface reactions are classified in two groups—physicochemical and physicomechanical. Various methods for measurement of surface roughness and surface area; the corrosion mechanism, corrosion inhibitors, high-temperature oxidation, preferential corrosion, frictional properties, and lubricants, with special mention of graphites. 26 ref.

6A-103. Oberflächenprobleme des chemischen Verhaltens metallischer Werkstoffe. (Surface Problems in the Chemical Behavior of Metallic Materials.) W. Guertler. *Metalloberflache*, v. 3, sec A, July 1949, p. A133-A141.

Contrasts the behavior of single crystals of metals with that of multicrystalline aggregates encountered in practice. Importance of the surface in relation to the space lattice Adherent and nonadherent corrosion products. Shows that the corrosive behavior of alloys is determined by microscopic and submicroscopic structural factors. The basic prerequisites for producing chemically resistant alloys.

6A-104. Die Messung der Oxydationsgeschwindigkeit und Oxydschichtdicke von Metalloberflächen sowie der Lokalelementtätigkeit zwischen Metall und Metalloxyd. (Measurement of the Rate of Oxidation and Oxide Film Thickness on Metal Surfaces, Also the Local Galvanic Activity Between the Metal and Its Oxide.) F. Tödt, R. Freier, and W. Schwarz. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie*, v. 53, May 1949, p. 132-142.

The effects of oxide films on the atmospheric corrosion of metal surfaces (Fe, Cu, Cr-Ni steel, Pt and Ag) were studied. Rate of oxidation and film thickness were determined by measuring the current density in coulombs per sq. cm. at the metal surfaces 17 ref.

6A-105. Gas-Metal Reactions. Andrew Dravnieks and Hugh J. McDonald *Iron Age*, v. 164, Aug. 25, 1949, p. 78-82; Sept. 1, 1949, p. 84-86.

Reactions where the products of interaction are nonvolatile and form scale on the surface of the metal. Utilization of X-ray, electron diffractions, radioactive tracer, and electrical methods in studying reaction products. Techniques for measuring gas-metal reaction rates. Second and concluding installment: various continuous and discontinuous measuring techniques for measuring reaction rates, of which the microbalance and gas-volumetric methods are considered the most versatile. 71 ref.

6A-106. Work in Progress at the Chemical Research Laboratory, Teddington. *Electroplating and Metal Finishing*, v. 2, Aug. 1949, p. 525-529.

Accelerated corrosion testing; corrosion inhibitors; and inorganic chromatography.

6A-107. Corrosion Prevention. Frank LaQue. *Canadian Metals and Metallurgical Industries*, v. 12, Aug. 1949, p. 14-17, 26, 29, 37.

The commonest method is use of protective coatings. Other methods, such as control of environment, cathodic prevention, design, and adjustment of composition of the metal.

6A-108. Procedures for Testing the Corrosion Resistance of Metals. F. A. Champion. *Industrial Chemist and Chemical Manufacturer*, v. 25, Aug. 1949, p. 383-387.

Modern corrosion testing methods and the relative importance in service of the various corrosion effects. 16 ref.

6A-109. Surface Attack of Metals by Fatty Acids and the Formation of Lubricating Layers. D. Tabor and E. D. Tingle. *Butterworths Scientific Publications* (London), "Surface Chemistry", 1949, p. 217-220.

New explanation for boundary lubrication of solids. Points out that former explanation is an over-simplification.

6A-110. Etalement des Huiles à la Surface des Métaux Projetés. (Spreading of Oils Over the Surfaces of Gold and Silver Films.) P. Cotton. *Butterworths Scientific Publications* (London), "Surface Chemistry", 1949, p. 233-238.

Experimental results for polar and nonpolar oils. Film thickness and structure.

6A-111. Role de l'attaque du métal par les acides gras à longue chaine dans le frottement onctueux. (Role of the Attack of Metal by Long-Chain Fatty Acids in Lubricated Friction.) J. Pomey and F. Loury. *Métaux & Corrosion,* v. 24, May 1949, p. 135-144.

Results of experimental investigation with particular emphasis on factors such as chain length and chemical reactions occurring at the lubricated surface. 15 ref.

6A-112. Die Atmosphärische Korrosion der Metalle. (Atmospheric Corrosion of Metals.) G. Schikorr. *Archiv für Metallkunde,* v. 2, no. 7, 1948, p. 223-230.

Literature survey and results of atmospheric corrosion tests in Germany showing effects of weather variations, atmospheric types (city, rural, marine, or industrial). Results of quantitative determination of the relationship between sulfur content of the air and atmospheric corrosion. 14 ref.

6A-113. Hydrofluoric Acid Versus Construction Materials. *Chemical Engineering,* v. 56, Sept. 1949, p. 229-230.

Part I of a symposium in which a representative group of construction materials are evaluated for services involving HF. Consists of the following: "Stainless Steel", W. G. Renshaw; "Hastelloy Alloys", C. G. Chisholm; and "Iron and Steel", A. W. Spitz.

6A-114. Protective Coatings for Fatty Acids. Fred L. Sharpe, Jr., and Kenneth Tator. *Chemical Engineering,* v. 56, Sept. 1949, p. 230, 232.

Use of phenolformaldehyde resins and various other resinous coatings to prevent corrosion of metals by fatty acids.

6A-115. Corrosion Testing Facilities at Kure Beach, North Carolina. Ivy M. Parker. *Corrosion,* v. 5, Sept. 1949, p. 303-307.

Extensive illustrated description.

6A-116. Lubricating Oil Additives. Part IV. Oxidation Inhibitors and Detergents. V. A. Kalichevsky. *Petroleum Refiner,* v. 28, Sept. 1949, p. 85-93.

Extensive tabular lists of patented oxidation and corrosion inhibitors and metal derivatives of the detergent type, indicating both trade and chemical names. Name of compound or group of compounds is accompanied by patent numbers, date, and inventors' names.

6A-117. Corrosion at Elevated Temperatures and Pressures. M. G. Fontana. *Alloy Casting Bulletin,* no. 13, Aug. 1949, p. 5-6.

Research program includes a variety of metals, alloys, and corrosion media. Work to date covers corrosion of CF-8 and CF-8M type alloys, particularly by nitric acid. Data for Ti and CF-8 in two conditions. (CF-8 contains 19.28% Cr, 9.65% Ni, 0.068% C, 1.52% Si, and 0.67% Mn.)

6A-118. The Cost of Corrosion to the U. S. Herbert H. Uhlig. *Chemical and Engineering News,* v. 27, Sept. 26, 1949, p. 2764-2767.

Quantitative estimates based on a survey. 16 ref.

6A-119. Notes on Galvanic Corrosion. F. L. Laque and W. D. Mogerman. *World Oil,* v. 129, Oct. 1949, p. 153-154, 158.

The theory of bimetallic corrosion, and the relative intensity of corrosion of metals placed in conditions of electrolytic action. Recommendations as to choice of metals with emphasis on one-metal construction wherever possible.

6A-120. Investigation of Cavitation Corrosion. G. Petracchi. *Engineers' Digest,* v. 10, Sept. 1949, p. 314-316.

Previously abstracted from *La Metallurgia Italiana.* See item 6A-52, 1949.

6A-121. A Comparison of Some Metals for Use in Acid Pickling Baskets. E. E. Halls. *Sheet Metal Industries,* v. 26, Oct. 1949, p. 2127-2130, 2136.

Experimental results for a series of common metals and alloys in several types of pickling solutions.

6A-122. Neue Versuche über die Lokalelementtätigkeit von Oxydbedeckungen auf Metalloberflächen. (Recent Experiments on the Local Galvanic Action of Oxide Coatings on Metal Surfaces.) F. Tödt. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 273-278.

Studied by amplifying the rate of solution of "aerated" iron and by directly measuring the generated current of "aerated" metal surfaces (Fe, Cu, Pt) against a less noble and practically unpolarizable electrode. The two methods afford an insight into the local galvanic action between metal and oxide skin. Rates of oxidation and thickness of oxide skins. 19 ref.

6A-123. Iron Changes Corrosion Resistance of Copper-Nickel-Iron Alloy Tubes. W. Lynes. *Power,* v. 93, Nov. 1949, p. 84-85.

How and why of condenser-tube behavior in regard to pitting, corrosion, and impingement. Alloy makeup determines suitability of tubes for use with certain water conditions.

6A-124. Hydrofluoric Acid Versus Construction Materials. Part III. (Concluded.) *Chemical Engineering,* v. 50, Oct. 1949, p. 227-228, 230, 232, 234, 236, 238.

Includes the following sections: "Lead", Kempton H. Roll; "Silicones", J. A. McHard and A. F. Kolb; "Nickel, Nickel Alloys", W. Z. Friend; "Durimet-20", Walter A. Luce; "Rubber-Lined", C. L. Lockman; and "Protective Coatings", Kenneth Tator. Not recommended for use with HF are chemical stoneware (F. E. Herstein), tantalum (Allan L. Percy), glass-lined steel (S. W. McCann), and aluminum (Ellis D. Verink, Jr.).

6A-125. Corrosion. R. S. Peoples and F. W. Fink. *Metals Review,* v. 22, Oct. 1949, p. 4-7.

Survey of the year's literature points up the urgent need of conserving raw materials by protective and preventive measures. Includes references on corrosion-preventive coatings. (References to ASM Review of Current Metal Literature.)

6A-126. Electrochemical Principles of Cathodic Protection. R. H. Brown and G. C. English. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 7-11.

Theory of cathodic protection developed from the local cell picture of electrochemical corrosion. Since both polarization and IR drop through the film resistance contribute to cathode potential, equations are formulated having terms representing each effect. Chemical-changes due to continued passage of current. Includes circuit diagrams. 12 ref.

6A-127. Characteristics and Field Use of Electrical Instruments for Corrosion Investigations and Cathodic Protection. M. C. Miller. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 12-33.

Recommended procedures. Includes circuit diagrams.

6A-128. Characteristics of Half-Cells Used as Reference Electrodes. Paul Fugassi. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 34-36.

Measurement of thermodynamic and nonthermodynamic quantities. Cell used for control of cathodic-protection methods. 10 ref.

6A-129. Laboratory Methods for Determining the Current Required for Cathodic Protection. R. B. Mears and J. M. Bialosky. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 37-46.

Direct, analytical, indirect, zero-current, and zero-potential methods. Correlation with current of freely corroding specimen. 36 ref.

6A-130. Current Required for Cathodic Protection. N. P. Peifer. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 47-53.

12 references.

6A-131. Detection, Measurement and Mitigation of Stray-Current Electrolysis. Frank B. Fry. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 54-56.

Reviews methods.

6A-132. Detection and Measurement of Currents Other Than Stray Currents, Including Magnetic Earth Currents. Lyle R. Sheppard. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 57-63; discussion, p. 63-65.

Currents caused by electrochemical cells, thermocouples, metal stress differences, changes in magnetic fields, and microbiological action. Circuits developed for resistance and potential-difference measurements which minimize errors attributable to polarization and measuring circuit resistance. 16 ref.

6A-133. Coordination of Cathodic Protection Installations To Avoid Interference With Adjacent Structures. L. B. Nelson. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 66-68, 69-72; discussion, p. 68-69.

Conditions that directly affect interference. Methods now used to determine and avoid it.

6A-134. Use of Rectifiers as an External Source of Protective Currents. F. A. Waelterman. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 73-75, 76; discussion, p. 75.

Practical consideration in design and application of rectifiers to cathodic protection.

6A-135. The Use of Wind-Driven Generators as an External Source of Protective Currents. M. L. Jacobs. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 77; discussion, p. 77-79.

New system of using wind electric generators in combination with Mg

anodes to secure a system of continuous cathodic protection for pipelines.

6A-136. Economic Factors Bearing on Application of Cathodic Protection. D. B. Good. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 80-81, 82-87; discussion, p. 82.

6A-137. Locations and Materials for Anodes for Impressed Current. Derk Holsteyn. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 88-92.

Design of a cathodic unit installation.

6A-138. Relative Merits of Various Cathodic Protection Current Sources. G. R. Olson and C. W. Evans. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 93-96.

Limitations and advantages of each source.

6A-139. Physical and Chemical Characteristics of Zinc Anodes. E. A. Anderson. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 97-100.

Relation to cathodic protection.

6A-140. Practical Use of Galvanic Anodes. Hugo W. Wahlquist and Henry M. Fanett. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 114-143.

Particular emphasis on Zn and Mg anodes used for cathodic protection of pipelines. Type of line, coated or bare, character and resistivity of soil, current requirement, climate, rainfall, location, accessibility for maintenance, and presence of large stray or long-line currents. 19 ref.

6A-141. Effect of Environment Characteristics on Cathodic System Design. F. J. LeFebvre and L. P. Sudrabin. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 185-188; discussion, p. 188.

Effects of water characteristics on design and operation of cathodic protection systems.

6A-142. Relations Between Protective Coatings and Cathodic Protection. Guy Corfield. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 189-191; discussion, p. 190.

Electric energy requirements for protection of underground piping having coatings of various degrees of electrical resistivity.

6A-143. Cathodic Protection in the Control of Stress-Corrosion Cracking. Hugh J. McDonald and James T. Waber. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 192-197, 199-203; discussion, p. 197-198.

Effect of the large difference in anodic and cathodic area on protective current density. The effect of stressing within the plastic range on electrode potential of a metal. The role of electrical protection in corrosion fatigue. 17 ref.

6A-144. Kure Beach Begins Its Fifteenth Year. *Inco*, v. 23, Fall 1949, p. 4-7

Corrosion-testing station for seawater and marine-atmosphere testing.

6A-145. Effects of Corrosion of Aluminum Electric Cables. Results of French Investigation. *Wire Industry*, v. 16, Oct. 1949, v. 823-824.

Results of inspection of war-damaged Al-steel power cables. These cables were made by winding aluminum wires around a galvanized steel core.

6A-146. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry*, v. 41, Nov. 1949, p. 83A-84A.

Effects on oxidation resistance of alloying Fe, Ti, and Mo with Cr discussed on the basis of the literature.

6A-147. Corrosion Tests in the Processing of Soap and Fatty Acids. W. Z. Friend and J. F. Mason, Jr. *Corrosion*, v. 5, Nov 1949, p. 355-367; discussion, p. 367-368.

Tests made in operating equipment in soap and fatty acid plants during the past 10 years, using mostly the spool-type testing device. The program included nickel, Monel, Inconel, and other high-nickel alloys, stainless steels, copper and copper alloys, aluminum, chemical lead, mild steel, alloy steels, and plain and alloy cast irons.

6A-148. Cooperative Corrosion Testing in the Wood Pulping Industry. T. R. Gaulke and M. A. Scheil. *Corrosion*, v. 5, Nov. 1949, p. 392-401; discussion, p. 401-402.

How a cooperative corrosion testing program can be used to select the proper material for a particular job; how heat treatment, welding, and working this material influence its corrosion resistance, and guide the equipment manufacturer in his methods of fabrication.

6A-149. Korrosion metallischer Werkstoffe im Bauwesen. (Corrosion of Metallic Materials in the Construction Industry.) J. Friedli. *Schweizer Archiv für angewandte Wissenschaft und Technik*, v. 15, Sept. 1949, p. 261-265.

Chemicals (especially chlorides) added to mortar and to cement, and the presence of moisture, are the most important factors in corrosion of ferrous and nonferrous structural

metals. Photographs and a table show the degree of corrosiveness of 20 different materials.

6A-150. Theory of Formation of Oxide Films on Alloys. (In Russian.) A. N. Orlov and A. A. Smirnov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 550-559.

Further development of the theory of high-temperature oxidation of binary alloys using a model developed previously by one of the authors. Influence of temperature on rate of oxidation.

6A-151. Polarization Method for Accelerated Corrosion Testing of Metals in Sea Water. (In Russian.) L. V. Elin and E. Sh. Ryt. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 811-813.

Modification of method developed originally by G. V. Akim consists of application of a ballistic galvanometer as the measuring device, thus simplifying the circuit. Corrosion stability is determined from the differential polarization curve, relating the current to the potential difference between two specimens of the metal being tested.

6A-152. L'oxydation des métaux. (Oxidation of Metals.) N. F. Mott. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. D84-D88.

Attempts to establish a new and more satisfactory method of metal oxidation on the basis of rates of formation of oxide film on the metal as a function of time and temperature; mechanism of adherence of oxide to the metal surface; and structure and orientation of the oxide film. 21 ref.

6A-153. L'oxydation des métaux et les réactions dans l'état solide. (Oxidation of Metals and Reactions in the Solid State.) Jacques Bénard. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. D89-D95.

Oxidation at high temperatures was investigated with particular emphasis on kinetics, mechanism of film growth, and influence of crystal orientation on rate of oxidation. 10 ref.

6A-154. Oxide Films Formed on Metals and Binary Alloys. An Electron Diffraction Study. J. W. Hickman. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 547-564.

Previously abstracted from *Metals Technology*. See item 6A-1, 1949.

6A-155. (Book) **Chemistry Research, 1947.** 91 pages. 1949. His Majesty's Stationery Office, London. 2s., net.

General activities of British governmental research organization and current research by the various groups which include corrosion of metals.

6A-156. Fluorine Versus Construction Materials. *Chemical Engineering,* v. 56, Nov. 1949, p. 201-202.

A symposium in which several manufacturers of construction materials evaluate their products for services involving fluorine. Consists of the following: "Carbon and Graphite", J. F. Revilock and N. J. Johnson; "Stainless Steel", W. G. Renshaw; "Lead", Kempton H. Roll; "Iron and Steel", A. W. Spitz; and "Worthite", W. E. Pratt. Also includes statements of F. E. Herstein, Allan L. Percy, and Ellis D. Verink concerning chemical stoneware, tantalum, and aluminum. These materials are not recommended for fluorine service.

6A-157. Corrosion Problems in the Pulp and Paper Industry. Roy P. Whitney. *Corrosion,* v. 5, Dec. 1949, p. 435-439.

General problems and difficulties specific to sulfite pulping, alkaline pulping, bleaching, and papermaking. Recommendations for choice of alloys.

6A-158. Plant Corrosion in the Fatty Acid Industry. R. J. Paul. *Corrosion,* v. 5, Dec. 1949, p. 439-442.

Older materials used for equipment, pumps, and piping and new material applications. Relative suitability of materials is indicated by the results of operating specific equipment under plant conditions. 14 ref.

6A-159. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, Dec. 1949, p. 79A-80A.

Developments of the past few years in metals and alloys for combating corrosion.

6A-160. The Corrosion of Metals. W. H. J. Vernon. *Journal of the Birmingham Metallurgical Society,* v. 29, Sept. 1949, p. 131-152.

Economics, theory, testing, and prevention. 41 ref.

6A-161. Phénomènes periodiques dans la corrosion des métaux par les vapeurs. (Periodic Phenomena in Corrosion of Metals by Vapors.) René Dubrisay. *Comptes Rendus* (France), v. 229, Oct. 24, 1949, p. 829-831.

On placing a fragment of iodine on silver foil, Fizeau observed formation of a series of concentric colored rings. This phenomenon was studied experimentally and theoretically. A formula is developed for determining thickness of the iodide

film for a given distance from the fragment.

6A-162. Costs of Corrosion Control. W. H. J. Vernon. *Canadian Metals and Metallurgical Industries,* v. 12, Nov. 1949, p. 24-25, 34-36.

16 references.

6B—Ferrous

6B-1. Bone Fixation and the Corrosion Resistance of Stainless Steels to the Fluids of the Human Body. Colin G. Fink and Joseph S. Smatko. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 271-277.

Bone fixation plates and screws were prepared from three different stainless steels and from one Cr-Co alloy. These were tested under conditions closely duplicating those prevailing in the human body. Results showed that stainless steel, such as AISI Type 302, is the most corrosion resistant. 17 ref.

6B-2. Management Information on Cathodic Protection. *Petroleum Engineer,* v. 20, Dec. 1948, p. 262-263.

A brief outline.

6B-3. The Catalytic Oxidation of Sulphur Dioxide on Metal Surfaces. Part II. The Reaction of Sulphur Dioxide and Oxygen at a Mild Steel Surface. G. Tolley. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 401-404.

Rates of combination of SO_2 and O_2 at a mild steel surface at various temperatures with dry and moist gases were measured. Sulphide and sulphate formation is found to occur simultaneously, the sulphide being concentrated close to the surface of the steel. Water vapor inhibits sulphide and sulphate formation, but increases the rate of oxidation. Scale formed in each case was analyzed and examined microscopically.

6B-4. The Corrosion of Metals in Atmospheres Containing Sulphur Dioxide. Part I. G. Tolley. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 404-407.

Results are presented for the corrosion of mild steel, sprayed aluminum, and aluminized steel by air containing from 0.2%-6% SO_2 at temperatures of 300-700°. The influence of gas velocity, temperature, and concentration of SO_2 was determined. Corrosion-time curves up to 40 hr. are given for 0.2% and 4% SO_2-air mixtures at 600°. Small concentrations of water vapor in the gas decrease corrosion of mild steel, but further additions increase it. The catalytic formation of SO_3 on the surface of the metals is of great importance in determining the rate of corrosion.

6B-5. Evaluation of Pickling Inhibitors From the Standpoint of Hydrogen Embrittlement. III. Conditions of Cathodic Pickling. (Concluded.) C. A. Zapffe and M. E. Haslem. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1126-1130, 1172-1175.

In tests conducted under cathodic-pickling conditions the variable of metal attack is eliminated, the production of hydrogen on the metal surface is controlled, and any polar or ionic constituents of the inhibitor come under the influence of an electric field. Numerous reagents were tested. Most of them increase embrittlement both for mild and stainless steel. A very few inhibit embrittlement for mild steel; none for stainless. Results are shown graphically.

6B-6. Drill Pipe Corrosion Problems. G. L. Corrigan and A. E. Schlemmer. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 48-PET-2, 1948, 9 pages.

Known methods for combatting corrosion, together with their possible bearing on the problem. The general corrosion problem; factors tending to promote and to prevent corrosion.

6B-7. Polar-Type Rust Inhibitors; Methods of Testing the Rust-Inhibition Properties of Polar Compounds in Oils. H. R. Baker, D. T. Jones, and W. A. Zisman. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 137-144.

Theory outlined in a previous paper is used to show that the various methods used emphasize different variables. It is concluded that no single test can suffice for all needs. The turbine-oil rusting test, the static water-drop corrosion test, and the fog-cabinet corrosion test are described and recommended; the latter two being new. Data for a number of different types of inhibitors and inhibited fluids.

6B-8. Action of Organic Acids on Stainless Steel. Charles F. Poe and E. M. Van Vleet. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 208-210.

Strips of stainless resist the action of most dilute organic acids at 25° C. and at boiling temperatures, with the exception of boiling oxalic acid in normal concentration.

6B-9. Improvements in Acid Resisting

Silicon Iron Alloys. J. E. Hurst. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 72-79; discussion, p. 79-80.

Compositions, structures, properties, welding, and heat treatment procedures.

6B-10. Structure of Crystals of y-$Fe_2O_3 \cdot H_2O$, Formed During Corrosion of Iron. (In Russian.) N. A. Shishakov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 953-955.

Results of X-ray diffraction study.

6B-11. Electronographic Investigation of the Size of Iron Crystals and the Thickness of Oxide Films Formed on Their Surfaces. (In Russian.) P. D. Dankov and N. A. Shishakov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Aug. 1948, p. 956-960.

The above was investigated by X-ray and electron microscopy. Data indicate that the film is composed at least of two elementary nuclei of gamma Fe_2O_3,, and it is possible that one of them is Fe_3O_4 and the other Fe_2O_3. The range of thickness is about 16-18A.

6B-12. Behavior of Hydrogen in Steel During and After Immersion in Acid. Lawrence S. Darken and Rodney P. Smith. *Corrosion,* v. 5, Jan. 1949, p. 1-16; discussion, p. 16.

Experiments described are of two principal types, one designed to measure the permeability of steel to hydrogen, the other to measure the saturation concentration and diffusivity of hydrogen in steel, in each case with particular reference to factors associated with the solution in which the steel was immersed. Appendix consists of a derivation of an equation for diffusion of hydrogen from a plane surface into steel.

6B-13. Cathodic Protection Applied to Gas and Electric Utility Operations. William J. Schreiner. *Corrosion,* v. 5, Jan. 1949, p. 17-24.

Methods and experiences of Cincinnati Gas and Electric Co.

6B-14. Experience at Bagnell Dam to Prevent Corrosion of Underwater Steel and Iron. Turner White, Jr. *Corrosion,* v. 5, Jan. 1949, p. 25-26.

Experiences of past 10 years with cathodic protection and with aluminum paint.

6B-15. Corrosion Problems in Water Wells. T. E. Larson. *Corrosion,* v. 5, Jan. 1949, p. 27-30; discussion, p. 30-31.

Experience gained from installations during the past seven years indicates that corrosion of deep-well pumps may be mitigated by proper application of cathodic protection. Recommended procedures.

6B-16. Attenuation Equations Applied to Cathodic Protection by Distributed Drainage. E. P. Doremus, G. L. Doremus, and M. E. Parker, Jr. *Corrosion,* v. 5, Jan. 1949, p. 32-36.

Attenuation equations have been given which describe variations in current, potential, and cathodic current density along a long uniform structure protected by drainage from a single point. A later paper gave equations for a structure having a finite number of smaller drainage points. Further modification, including consideration of an infinite number of small drainage points, leads to further simplification of the resulting equations. The latter type of installation is employed in the use of magnesium anodes.

6B-17. Influence of Telurium on Hydrogen Absorption of Steel During Its Cathodic Polarization in Solutions of Sulphuric Acid. (In Russian.) M. N. Polukarov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 611-619.

Experimental data. 12 ref.

6B-18. Solution of Carbon Steel by Monobasic Acids of the Aliphatic Series. (In Russian.) V. D. Yakhontov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 667-675.

Results for the individual acids of the aliphatic series.

6B-19. Cathodic Protection. *Light Metals,* v. 11, Dec. 1948, p. 674-681.

First section of an exhaustive review of current literature and theory concerning the causes and prevention of chemical attack on steel, principally by soils or in soil environments. The development of systems in present use. Emphasis is on use of magnesium anodes to safeguard pipelines. (To be continued.)

6B-20. Tests of a 4,800-HP. Locomotive Gas Turbine. Alan Howard and B. O. Buckland. *Railway Age,* v. 126, Jan. 15, 1949, p. 22-26.

The condition of working parts after various periods of operation, with respect to wear, corrosion, and ash deposition. The nozzle alloy used contained 16% Cr, 25% Ni, 6% Mo, balance Fe. It was found to be unsatisfactory from the corrosion viewpoint, above 1500° F.

6B-21. Electron Diffraction Studies on the Nature of the Corrosion Resistance of Stainless Steel. On the Ferrous Nickel Chromate Formed on the

Surface of Stainless Steel. Shigeto Yamaguchi, Tadayuki Nakayama, and Tominosuke Katsurai. *Journal of the Electrochemical Society,* v. 95, Jan. 1949, p. 21-24.

Electron diffraction measurements were made of surface films produced on 18% Cr, 4% Ni; and 19% Cr, 9% Ni stainless steels. The films were formed by exposing the metals to water vapor at elevated temperatures and pressures in an autoclave. Comparison with X-ray diffraction data indicate that the film may be a solid solution of $(Ni, Fe)CrO_4$.

6B-22. Sulphate-Reducing Bacteria and Internal Corrosion of Ferrous Pipes Conveying Water. K. R. Butlin, Mary E. Adams, and Margaret Thomas. *Nature*, v. 163, Jan. 1, 1949, p. 26-27.

Examination of "tubercles" on the inside of water mains shortly after removal from the soil disclosed presence of sulfide sulfur, elementary sulfur, severe graphitization of the cast iron underneath the "tubercles," and comparatively large numbers of sulfate-reducing bacteria. Conditions were roughly comparable to those obtained in anaerobic microbiological corrosion of ferrous-pipe exteriors.

6B-23. Causes and Prevention of Drill Pipe and Tool Joint Troubles. Part IV. Drill Pipe. Part V. Tool Joints. H. G. Texter, R. S. Grant, and S. C. Moore. *World Oil*, v. 128, Jan. 1949, p. 90, 92, 96, 100, 102; discussion, p. 102, 104; Feb. 1, 1949, p. 96-97, 100-102, 104.

Part IV deals with troubles due to worn pipe, crooked pipe, collapsed pipe, eccentric-wall pipe, internal erosion, and magnetism. Part V describes various types of mecanical difficulties with tube joints, such as longitudinal splitting, galled or frozen threads, and wabble failures. 17 ref. (To be concluded.)

6B-24. Pipe Line Corrosion Control With Cathodic Protection. K. D. Wahlquist. *World Oil,* v. 128, Feb. 1, 1949, p. 163-164, 166, 168, 170.

Recommended practices.

6B-25. Corrosion Fatigue of Steel Under Asymmetric Stress in Sea Water. A. J. Gould. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 11-16.

Severity of corrosion-fatigue in sea water under reversed stress with superimposed tensile stress was found to be almost independent of mean stress, provided it is not excessive. This result was obtained on polished specimens, scale-covered specimens, and specimens descaled by pickling.

6B-26. Weather Resistance of Porcelain Enamels Exposed for Seven Years. William N. Harrison and Dwight G. Moore. *Journal of the American Ceramic Society,* v. 32, Jan. 1, 1949, p. 15-25.

A study begun at the National Bureau of Standards in 1939 involved 864 1-ft. square panels and an equal number of 4 x 6-in. laboratory specimens. Panels were exposed in Washington, D. C., St. Louis, Lakeland, Fla., and Atlantic City, N. J. Results showed good correlation between acid resistance and resistance to weathering. When initial coverage was complete and no mechanical damage had occurred, protection was unimpaired. Colored enamels faded only on panels having poor acid resistance. 13 ref.

6B-27. Angriff von Eisen in technischen Schwefelsäuren und Nitrosen. (Corrosion of Iron in Commercial Sulfuric Acids and Nitrosylsulfuric Acid Solutions.) Franz Perktold. *Angewandte Chemie,* ser. B, v. 20, May-June 1948, p. 125-128.

Experiments made to determine the effect of temperature, density, and nitrosylsulfuric acid content on the resistance of different types of iron to corrosion, with the object of replacing the lead linings of sulfuric acid vessels by iron. 16 ref.

6B-28. Uber die Korrosionsverhältnisse in den Auspuffleitungen von Verbrennungsmotoren. (Corrosion of the Exhaust Pipes of Internal-Combustion Engines.) Gerhard Schikorr. *Metalloberfläche,* v. 2, April 1948, p. 73-79.

Apparatus for quantitative determination of the corrosiveness of exhaust gases on metal at about 70, 180, and 400° C. Results for cast iron and copper. 25 ref.

6B-29. Korrosionserfahrungen an Stahlrohren aus Kalt- und Warmwasserleitungen und aus Kesseln. (Corrosion Experiences on Cold and Hot Water Pipes and Boilers.) W. M. Muller. *Archiv fur Metallkunde,* v. 1, Nov.-Dec. 1947, p. 480-487.

A general discussion, based in part on the examination of samples taken from water lines after various service periods, and in part on laboratory experimentation. The difficulties of welding corroded metal. 11 ref.

6B-30. Corrosion Inhibition With Chromate. 1. Introduction and General Data. 2. Drilling—Oil Production—Gas

Condensate. 3. Gas Processing Plants and Refineries. 4. Corrosion Problems in Pipe-Line Systems, Tankers, Petroleum Distribution Equipment.** Marc Darrin. *Oil and Gas Journal,* v. 47, Jan. 13, 1949, p. 83, 85, 87, 98; Jan. 20, 1949, p. 87-88, 91-93; Feb. 3, 1949, p. 85, 87-89; Feb. 10, 1949, p. 82-83, 85.

Extensive fundamental and practical information.

6B-31. Hard Surfacing of Cast-Steel Propeller Blades. K. B. Young, H. J. Nichols, and M. J. Nolan. *Welding Journal,* v. 28, Feb. 1949, p. 153-157.

Examination of hard surfaced, cast steel propeller blades after service in salt water in both warm and cold climates.

6B-32. Galvanic Action Between Lead, Worthite and Other Acid-Resistant Alloys in Sulfuric Acid. W. E. Pratt and E. T. Collinsworth, Jr. *Corrosion,* v. 5, Feb. 1949, p. 39-44.

Mechanism involved in the changes of the relative potentials of lead and some stainless steels, notably Worthite, in H_2SO_4. The work was done in order to shed light on corrosion of chemical pumps in which Worthite is anodic to large areas of lead. The trouble can be avoided by use of an oxidizing agent such as sodium chromate, ferric sulfate, or copper sulfate; by re-aeration; or by insulation to prevent contact of the two metals.

6B-33. A Geographic Study of Deposits and Corrosion. F. N. Alquist. *Corrosion,* v. 5, Feb. 1949, p. 45-53.

Results of a survey of the compositions of water-formed deposits in boilers, pipe-lines, and condensers, and of resulting corrosion, for various areas of the U. S. Data are based on 143 samples from ten industrially important states.

6B-34. Mitigation of Corrosion on City Gas Distribution Systems. A. D. Simpson, Jr. *Corrosion,* v. 5, Feb. 1949, p. 59-69.

Corrosion-leakage experiences on city-distribution systems and experiences with cathodic protection.

6B-35. Cathodic Protection. (Continued.) *Light Metals,* v. 12, Jan. 1949, p. 43-50.

Concludes discussion of the Mg or Al anodes; problems of backfills. (To be concluded.)

6B-36. Weather Resistance of Porcelain Enamels. *Better Enameling,* v. 20, Feb. 1949, p. 6-8.

Previously abstracted from article by William N. Harrison and D. G. Moore in *Journal of the American Ceramic Society.* See item 6b-26, 1949.

6B-37. Contribution a l'étude de la corrosion des métaux par les carburants. (The Study of Metal Corrosion by Fuels.) P. Schläpfer and A. Bukowiecki *Métaux & Corrosion,* v. 23, Dec. 1948, p. 267-277.

The corrosive action of modern fuel components such as hydrocarbons, alcohols, aldehydes, ketones, and esters on Fe, Al, Zn, Pb, Cu, and Mg alloys were investigated.

6B-38. Corrosion des metaux par les liquides organiques. (Corrosion of Metals by Organic Liquids.) R. Dubrisay. *Metaux & Corrosion,* v. 23, Dec. 1948, p. 278-284.

The corrosion of Cu, Al, Ni, and Sn by fatty acids in organic solvent solutions of chlorine solvents (CCl_4, $CHCl_3$) and CH_3OH.

6B-39. Passivation of Iron and Cathodic Reduction of the Hydrate of Ferrous Oxide. (In Russian.) S. A. Rozentsveig and B. N. Kabanov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Oct. 1948, p. 1214-1218.

The yield from anodic oxidation of a pure iron electrode in a basic solution decreases considerably during repetition of cycles of "cathodic reduction-anodic oxidation". Causes were investigated.

6B-40. Uber periodische chemische Reaktionen. I. (Periodic Chemical Reactions. I.) K. F. Bonhoeffer. **II. Die kathodische Polarisation von Eisen in Salpetersäure.** (The Cathodic Polarization of Iron in Nitric Acid.) K. F. Bonhoeffer, Elfriede Brauer, and Gunter Langhammer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 51, Jan. 1948, p. 24-37.

Part I: conditions necessary for periodic reactions to occur; why, in heterogeneous systems, preliminary conditions are especially favorable to periodic reactions. Part II: results of experiments on the topic indicated. 20 ref.

6B-41. Uber periodische Reaktionen. III. Der Refraktärzustand frisch-passiven Eisens in konzentrierter Salpetersäure. (Concerning Periodic Reactions. III. The Refractory State of Newly Passivated Iron in Concentrated Nitric Acid.) K. F. Bonhoeffer, Vera Haase, and Gunter Langhammer. **IV. Theorie der kathodischen Polarisation von Eisen in Salpetersäuer.** (IV. Theory of the Cathodic Polarization of Iron in Nitric Acid.) K. F. Bonhoeffer and G. Langhammer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie,* v. 52, March 1948, p. 60-72.

The behavior of a passive iron

wire in concentrated HNO_3 which had been previously cathodically activated by this acid. A theory concerning the chemical reactions involved in the cathodic polarization of iron is developed. 17 ref.

6B-42. A New Method of Corrosion Preventive Packaging. A. Wachter. *American Paper Converter,* v. 23, Feb. 1949, p. 14-16.

A slightly volatile corrosion inhibitor (VPI—composition not given) is applied as a coating to wrapping paper and packages for metal objects. VPI is said to inhibit corrosion even when oxygen and water are present; thus a piece of bare polished steel immersed in water containing VPI will not rust.

6B-43. Cathodic Protection. *Light Metals,* v. 12, Feb. 1949, p. 84-93.

Concluding section is concerned with installation details and results obtained in various cases. Comparative cost data for Al, Mg, and Zn anodes.

6B-44. Measurement of Galvanic Currents Around an Underground Structure. N. P. Peifer and F. E. Costanzo. "Pittsburgh International Conference on Surface Reactions", 1948, p. 114-126.

Previously abstracted from *Corrosion and Material Protection.* See item 6b-98, 1948.

6B-45. The Action of Organic Inhibitors in the Acid Attack of Mild Steel. T. P. Hoar. "Pittsburgh International Conference on Surface Reactions", 1948, p. 127-134.

Weight-loss and single-electrode-potential measurements of mild steel in cold and hot 10% H_2SO_4, with and without addition of various organic inhibitors. In all the experiments in cold acid, and in some of them in hot, the corrosion potential is shifted in the "noble" direction by addition of inhibitor. A new precise technique for weight-loss and corrosion-potential measurements in hot acid solutions. 19 ref.

6B-46. Mechanism of Pigmentation of Anti-Corrosion Paints and Varnishes. Hans Wagner. *Paint and Varnish Production Manager,* v. 29, Mar. 1949, p. 63-64, 66-70.

Electrochemical evaluation. Protection by over-activation of iron surfaces; protection by passivation and oxide-skin formation; and cathodic and anodic effects of pigments.

6B-47. Marine Boiler Deterioration. I. G. Slater and N. L. Parr. *Engineer,* v. 187, Feb. 11, 1949, p. 158-161; Feb. 18, 1949, p. 199-201. A condensation.

The various forms of corrosion, scaling, and failure which occur. Recommendations for minimization.

6B-48. Corrosion in Natural Gas-Condensate Wells; pH and Carbon Dioxide Content of Well Waters at Wellhead Pressure. H. Arthur Carlson. *Industrial and Engineering Chemistry,* v. 41, Mar. 1949, p. 644-645.

Corrosion rate was correlated with the pH and CO_2 content. Rate of corrosion could not be correlated with iron nor organic acid content. 10 ref.

6B-49. Weather Resistance of Porcelain Enamels Exposed for Seven Years. William N. Harrison and Dwight G. Moore. *Journal of Research of the National Bureau of Standards,* v. 42, Jan. 1949, p. 43-56.

Previously abstracted from *Journal of the American Ceramic Society.* See item 6B-26, 1949.

6B-50. Influence de l'état de surface sur l'oxydation seche des austénites au Nickel-Chrome et du mode de finition des éprouvettes sur l'hystérésis mécanique des Aciers. (Influence of the State of Surface on the Dry Oxidation of Austenites With Nickel and Chromium, and Influence of the Method of Finishing of the Test Specimen on the Mechanical Hysteresis of Steels.) P. Chevenard and X. Waché. *Journées des Etats de Surface,* 1946, p. 237-241; discussion, p. 241.

The above were investigated with respect to the dry oxidation of chromium ferro-nickel (0.07% C, 9.8% Ni, 19.0% Cr) and the internal friction of carbon steels.

6B-51. Unusual Corrosion in High Pressure Boilers. S. T. Powell and L. G. Von Lossberg. *Corrosion,* v. 5, Mar. 1949, p. 71-78.

Various examples of corrosion embrittlement. Possible explanations for this form of attack. Examples of intercrystalline cracking resulting from high-temperature creep, caustic embrittlement, and hydrogen embrittlement.

6B-52. Galvanic Corrosion in Oil and Gas Well Fluids. F. L. LaQue. *Corrosion,* v. 5, Mar. 1949, p. 86-91.

Possibilities of galvanic action in solutions encountered in oil and gas wells. Factors that may be responsible for the frequent absence of galvanic action. Use of certain metal combinations is believed to be quite safe from the corrosion point of view.

6B-53. Note on Stress-Corrosion Cracking of Steels in the Presence of Sulphur Compounds. W. P. Rees. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys,

1948, p. 333-335; discussion, p. 463-484.

Failures of ferrous materials by stress-corrosion cracking, where the corroding agent was probably H_2S or some sulphur-containing compound. Laboratory experiments show that hardened and tempered alloy steels used for gas-cylinder manufacture are susceptible to stress-corrosion cracking in the presence of moist H_2S or CS_2.

6B-54. La corrosion aqueuse du Fer et de l'Acier. Mesures préventives. (Aqueous Corrosion of Iron and Steel. Preventive Methods.) F. N. Speller. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 7-14.

Research on the above in different countries. Various types of corrosion-preventive agents and methods, and their action. 21 ref.

6B-55. Recherches sur la composition variable des couches épaisses de rouille. (Research on the Variation of Composition of Thick Layers of Rust.) Eva Palmaer. *Métaux & Corrosion,* v. 24, Jan. 1949, p. 23-28.

The composition of the rust on objects under the action of the atmosphere or water during periods of time ranging from several up to 1000 years (an ancient sword) was determined. In a thick layer of rust the layer adjacent to the metal consists more of ferrous than of ferric compounds, and ferrous oxides are generally in the form of hydrates. Method of investigation.

6B-56. Causes of Flue Gas Deposits and Corrosion in Modern Boiler Plants. W. F. Harlow. *Engineer,* v. 187, Mar. 11, 1949, p. 271-273; discussion, p. 277-279. A condensation.

Universal nature of the problem, which, however, is much less serious in pulverized-coal installations. The most important cause of corrosion is the formation of SO_3 and resulting H_2SO_4 on passage of flue gases over heated boiler surfaces, especially at the higher temperatures. The test apparatus; effects of various factors including sulfur and impurity content; practical means of minimization.

6B-57. Corrosion: Surface Protection of Iron and Steel. *Iron and Steel,* v. 22, Mar. 1949, p. 93.

Detel Metal Undercoat invented by F. C. Dyche-Teague, England. The protective action does not depend on the medium or bonding material used, but on the pigment itself.

6B-58. Gas Cylinders. *Iron and Steel,* v. 22, Mar. 1949, p. 95.

Recent work on corrosion and its prevention. German research; references to original German publications.

6B-59. Oxidation of Turbine Oils in the Laboratory. D. Wyllie and G. C. N. Cheesman. *Journal of the Institute of Petroleum,* v. 35, Jan. 1949, p. 61-72.

The behavior of typical oils during a standard oxidation test was observed both under standard conditions and using a modified test. The oxidation-corrosion test of Pope and Hall was shown to be unsuitable for turbine oils, and the use of interfacial tension as a criterion of the extent of oxidation is not advised.

6B-60. Basic Principles of Corrosion Control by the Use of Lime. Edward S. Hopkins. *Technical Association Papers* (TAPPI), ser. 31, June 1948, p. 399-402.

Corrosion of iron and steel water pipe as a function of dissolved oxygen. Neutralization of free CO_2 in low alkaline waters by lime and the subsequent precipitation of a calcium carbonate-ferric oxide coating on pipe surfaces to retard corrosion. Cost of treatment and apparatus. 11 ref.

6B-61. The Use of Inhibitors for Controlling Metal Corrosion. Part III. Chromate and Dichromate Inhibitors. Part IV. Miscellaneous Inhibitors. G. T. Colegate. *Metallurgia,* v. 39, Feb. 1949, p. 219-221, Mar. 1949, p. 263-265.

Application and consumption. In part IV: use of silicates, phosphates, sodium nitrite and vapor phase inhibitors. Use of more than one inhibitor, and inhibitors used in acid pickling of steel.

6B-62. Korrosion und mechanische Beanspruchung. (Corrosion and Mechanical Fatigue.) Erich Gerold. *Metalloberfläche,* v. 3, Feb. 1949, p. 29-32.

Reciprocal effects of corrosion and stresses in steels.

6B-63. Der Oberflächenschutz der Metallteile in der Superphosphatindustrie. (The Surface Protection of Metal Parts in the Super-Phosphate Industry.) A. Kufferath. *Metalloberfläche,* v. 3, Feb. 1949, p. 40-42.

Proposes methods of increasing the resistance of metal parts to corrosive and abrasive wear.

6B-64. Korrosion und Korrosionsschutz von Eisen und Stahl in Bergwerksschächten. (Corrosion of Iron and Its Prevention in Mine Shafts.) Franz Eisenstecken. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 164.

An investigation covering ten different types of steel and four of cast iron and the protecting effect

of alloying elements and of coatings.

6B-65. Causes of Flue Gas Deposits and Corrosion in Modern Boiler Plants. W. F. Harlow. *Combustion,* v. 20, Mar. 1949, p. 35-39. A condensation.

See abstract of condensed version in *Engineer,* item 6B-56, 1949.

6B-66. Corrosion Phenomena in Connection With Steel Pressure Cylinders Used for Storage and Transport of Coal Gas. *Metallurgia,* v. 39, Mar. 1949, p. 284.

Some recent German work.

6B-67. The Corrosion of Heating Surfaces in Boiler Plants: Further Studies in Deposit Formation. J. R. Rylands and J. R. Jenkinson. *Institution of Mechanical Engineers, Proceedings,* v. 158, no. 4, 1948, p. 405-414; discussion, p. 414-425.

Preliminary laboratory tests showed a pronounced difference in behavior of cast iron and steel under the corrosive attack of the sulfur acids occurring in boiler gases. The inherent corrosion resistant properties of cast iron over a wide range of conditions are shown to be linked with its Si content. The puzzling "band corrosion" of air-heaters is shown to be a temperature and acid-concentration phenomenon.

6B-68. Effect of Various Aqueous Solutions Upon the Reactions at Pure Iron Anodes and Cathodes. Part I. W. W. Kittelberger and A. C. Elm. *Corrosion,* v. 5, Apr. 1949, p. 101-112.

Theoretical principles and results of extensive experimental investigation for the purpose of developing a method which would not only indicate when a metal is passive, but would also afford a means of measuring the "inhibitive power" of an environment. A method of this sort also should be applicable to measurement of the "corrosiveness" of noninhibitive solutions. Procedure and equipment. (To be concluded.)

6B-69. New Aspects of Rustproofing. Arthur Minich. *Paint, Oil and Chemical Review,* v. 112, Apr. 14, 1949, p. 42, 44, 46, 48.

Electrochemical aspects and limitations of rigid coatings. Different test methods used to evaluate a rustproofing agent known as "Nuodex Compound X-545"; results of its use under various conditions.

6B-70. Uber die Potentialbildung von Eisen in gepufferter Essigsäure. (The Electrical Potential of Iron in Buffered Acetic Acid.) Richard Ergang. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 76-80.

Results of investigation of the effect of solution pH on potential and loss of weight in 1 and 8% solutions of air-containing and air-free sodium acetate.

6B-71. Sur la corrosion fissurante d'aciers doux a faibles teneurs en additions dans les nitrates. (Concerning Intercrystalline Corrosion of Low-Alloy Steels in Nitrate Solutions.) E. Herzog. *Métaux & Corrosion,* v. 24, Feb. 1949, p. 29-42; discussion, p. 42-44.

The above was investigated for steels containing 2.3% Cr and 0.8% Al as maximum amounts, in the form of castings, rolled sheets, and welds. Influence of heat treatment, cold working, and decarburization, and resulting crystalline structure. Mechanism of intercrystalline corrosion. 21 ref.

6B-72. Corrosion. Mars. G. Fontana. *Industrial and Engineering Chemistry,* v. 41, May 1949, p. 95A-96A.

Environment and corrosion testing of small pieces of equipment in the pilot plant.

6B-73. Internal Corrosion of Crude-Oil Tanks. R. A. Brannon. *World Oil,* v. 129, May 1949, p. 190, 192, 194, 200.

Protective coatings and their relative efficacies, and measures which should add greatly to tank life in such areas as West Texas.

6B-74. Effect of Various Aqueous Solutions Upon the Reactions at Pure Iron Anodes and Cathodes: Part II. (Concluded.) W. W. Kittelberger and A. C. Elm. *Corrosion,* v. 5, May 1949, p. 155-167.

Experimental data for anodic reactions and for anodic passivity vs. current density in various aqueous solutions. Among the problems studied were: effects of variation in H-ion concentration; of variations in dissolved-O_2 concentration; and of chromate-ion concentration on behavior of pure-iron anodes.

6B-75. Corrosion in Sour Crude Storage Tanks. Derk Holsteyn. *Corrosion,* v. 5, May 1949, p. 168.

Corrosion before and after removal of some of the corrosion products. Gives analyses of products next to the steel and next to the space.

6B-76. Atmospheric Durability of Steels Containing Nickel and Copper—Additional Exposure Data. N. B. Pilling and W. A. Wesley. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 610-617.

Previously abstracted from preprint. See item 6b-68, 1948.

6B-77. Laboratory Corrosion Tests of

Iron and Steel Pipes. G. A. Ellinger, L. J. Waldron, and S. B. Marzolf. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 618-627.

Previously abstracted from preprint. See item 6b-67, 1948.

6B-78. Factors of Importance in the Atmospheric Corrosion Testing of Low-Alloy Steels. H. R. Copson. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 591-607; discussion, p. 608-609.

Previously abstracted from preprint. See item 6b-66, 1948.

6B-79. Corrosion of High-Pressure Steam Generators: Status of Our Knowledge of the Effect of Copper and Iron Oxide Deposits in Steam Generating Tubes. Richard C. Corey. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 907-925; discussion, p. 926-939.

Critically reviews published information and attempts to correlate it with the author's experiences and available theoretical data. 30 ref.

6B-80. Investigation of Causes and Prevention of Closure of Oven Burner Ports. *American Gas Association Testing Laboratories,* Research Bulletin, 54, Feb. 1949, 19 pages.

Causes indicated by analysis of replies to a questionnaire sent to 28 gas companies and by results of a field trip in manufactured-gas territories. Exploratory studies were conducted at burner temperatures of 725-1500° F. Increased tendency toward port closure at increased temperatures. It was found that port closure may be reduced by treating the burner surface with a suitable protective coating, or by altering the composition by use of alloying elements.

6B-81. Hydrogen Overpotential and the Partial Inhibition of the Corrosion of Iron. J. O'M. Bockris and B. E. Conway. *Journal of Physical & Colloid Chemistry,* v. 53, Apr. 1949, p. 527-539.

Two main mechanisms of corrosion inhibition during pickling have been suggested. Experimental work done in order to determine the true mechanism involved. Results indicate that the inhibition is by means of a direct effect on the hydrogen activation overpotential and not by mechanical protection through an adsorbed film. 23 ref.

6B-82. Cathodic Protection Design Considerations. Raymond H. McLeod. *Journal, American Water Works Association,* v. 41, May 1949, p. 411-412.

Use to prevent corrosion on pipelines, tanks, etc. Design and cost factors.

6B-83. Requirements of Cathodic Protection Systems. Frank E. Dolson. *Journal, American Water Works Association,* v. 41, May 1949, p. 413-416.

For protecting steel in contact with soil or water.

6B-84. Fatty Acids Versus Construction Materials. *Chemical Engineering,* v. 56, May 1949, p. 263-264, 266.

Part II of a symposium in which a representative group of construction materials are evaluated for services involving fatty acids. Consists of the following: "Rubber Lining", O. S. True; "Porcelain", John S. Chowning; "Chlorimet", Walter A. Luce; "Iron and Steel", A. W. Spitz; and "Worthite", W. E. Pratt.

6B-85. Kinetics of Electrode Processes on the Iron Electrode. B. Kabanov, R. Burstein, and A. Frumkin. "Electrode Processes" (*Discussions of the Faraday Society*, No. 1, 1947), p. 259-269; discussion, p. 298-302.

The following were studied on the basis of the literature and new data: influence of an oxide film on the anodic passivation of iron in alkaline solutions; mechanism of the dissolution and passivation of iron in alkaline solution; the electrochemical process at potentials of about 0.95 v; and anodic oxidation of iron in the presence of chlorine ions. A mechanism to explain the relationship between the formation of $Fe(OH)_2$ and the passivation of iron upon anodic oxidation. The mechanism of the anodic dissolution of iron in the presence of both chlorine and hydroxyl ions. 28 ref.

6B-86. Erkenntnisse uber das Rosten und den Rostschutz von Eisen und Stahl (1944 bis 1945). (Corrosion and Its Prevention on Iron and Steel (1944-1945).) (Concluded.) Heinrich Steinrath and Karl-Friedrich Mewes. *Stahl und Eisen,* v. 66-67, June 19, 1947, p. 229-231.

A review. 197 ref.

6B-87. Redoxsysteme als Korrosionsschutzmittel fur Metalle gegen Angriffe durch Wasser-in-öl-Emulsionen. (Redox Systems as Preventives of the Corrosion of Metals by Water-in-Oil Emulsions.) J. Reitstötter and J. Rzymkowski. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 9-12.

Results of a study of theoretical relationships between the potential of rusting iron and the required potential or rH value (defined) of an oxidative protective agent. Recommends certain redox systems for metal containers that are used for storing water emulsions.

6B-88. Die Wirkung von Zusätzen zur Beizsäure. (The Effect of Additions

to Pickling Acids.) K. Wickert. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 56-62.

Results of experimental studies on the effect of inhibitors and accelerators in the pickling of steel.

6B-89. Beizversuche mit Zink- und verzinkten, verrosteten Eisenblechen. (Pickling Experiments With Sheet Zinc and Zinc-Plated but Partly Rusted Sheet Iron.) W. Machu. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 62-69.

The solubility of Zn of 99.9% and 99.4% purity in inhibitor-containing dilute H_2SO_4 and in other acids, and also the behavior of Zn in cathodic pickling solutions. The effects of acid mixtures and of organic acids.

6B-90. Beitrag zur Einwirkung von HNO_3 konz. auf Ferro-Siliziumuberzuge bei Stahl. (The Effect of Concentrated HNO_3 on Coatings of Ferrosilicon on Steel.) Friedrich Erdmann-Jesnitzer. *Metall,* Aug. 1948, p. 264-265.

To protect the welded seams of structural steel from excessive normal and stress corrosion, it was proposed that they be coated with ferrosilicon. Effects of concentrated HNO_3 show that, to be effective, the coatings must be applied so that the layer forms a homogeneous structure of Fe-Si solid solution crystals.

6B-91. Cathodic Protection of Steel in Various Chemical Solutions, Using Magnesium, Zinc, and Zinc-Lithium Anodes. R. R. Rogers and W. R. G. Stewart. *Canadian Mining and Metallurgical Bulletin,* v. 42 (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), May 1949, p. 218-221.

Results of experimental investigation.

6B-92. Corrosion of Electroplated Steel in Automotive Applications. H. A. Pray. *Society of Automotive Engineers,* Preprint No. 338, 1949, 12 pages.

Purpose of the study was to determine relative usefulness of various composite Cu-Ni-Cr deposits as protective and decorative coatings on high-carbon steel in various typical atmospheres.

6B-93. The Adsorption of Organic Corrosion Inhibitors on Iron and Steel Surfaces: Electron Diffraction Studies. Norman Hackerman and Harold R. Schmidt. *Journal of Physical & Colloid Chemistry,* v. 53, May 1949, p. 629-638.

Use of electron-diffraction to detect adsorption of polar organic compounds on metal surfaces. It is shown that the firmness of adherence can be judged by a relatively simple procedure. A direct observation and measurement of orientation rate was made. 16 ref.

6B-94. Electrolytic Corrosion of Underground Pipes. Leslie T. Minchin. *Coke and Gas,* v. 11, May 1949, p. 153-156, 165.

Some modern methods of prevention with particular reference to Belgian practice.

6B-95. Oxide Films Formed on Pure Iron in Concentrated Hydrochloric Acid. W. I. Whitton. *Nature,* v. 163, May 14, 1949, p. 763-764.

It was found that treatment of specimens of enameling iron in hot dilute HCl gave fairly reproducible corrosion-rates. Treatment in cold concentrated HCl reduced the corrosion rate to approximately 1½ times less than the rate after treatment in the dilute acid. Reason for this retardation was found to be presence of an oxide film. Possible mechanisms.

6B-96. The Atmospheric Corrosion of Iron and Steel Wires. J. C. Hudson. *Wire Industry,* v. 16, Apr. 1949, p. 333-335, 337; May 1949, p. 417-419.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 6b-151, 1948.

6B-97. La corrosion superficielle dans le circuit de lavage des charbonnages des mines de l'état néerlandais. (Surface Corrosion in the Circuit for Coal Washing of the Netherlands State Mines.) H. G. Zelders. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 65-76; discussion, p. 76.

Attack on iron tanks found to be caused by a combination of corrosion caused by oxygen dissolved in the water and by erosion. Practical solution.

6B-98. Uber den Einfluss von Kolloiden auf die Korrosion durch Wasser in Warmwasserversorgungs- und Heizungsanlagen. (The Effect of Colloids on the Corrosiveness of Water in Hot Water Supply and Heating Plants.) W. Machu. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 71-76.

The effects of water-glass solutions, gelatins, agar-agar, starch, and other colloidal solutions on corrosion of soft iron at 60° C.

6B-99. Zum atmosphärischen Rosten des Eisens. (Atmospheric Rusting of Iron.) G. Schikorr. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 76-79.

Results of a study under different atmospheric conditions over a 5-yr. period.

6B-100. Pekanie miekkiej stali pod

wplywem korozji miedzykrystalicznej w roztworach azotanu amonowego. (Crack Formation in Mild Steel Under the Influence of Intercrystalline Corrosion Caused by Ammonium Nitrate.) M. Smialowski, B. Kopec, and J. Michalik. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 1-12.

Investigated using metallographic, crystallographic, chemical, and mechanical methods. Results indicate that the phenomenon is of great complexity depending on a series of factors other than the formation of iron nitrate, in contradiction to the theory of Waber and McDonald. 10 ref.

6B-101. Pipe Corrosion Mitigation Practices. A. H. Cramer. *American Gas Association, Proceedings*, 1948, p. 697-703.

Underground pipe-protection practices in urban and suburban areas. Field use of the Pearson Pipe Coating Fault Locator.

6B-102. Report of Committee A-5 on Corrosion of Iron and Steel. *American Society for Testing Materials*, Preprint 3, 1949, 19 pages.

An extended tabulation of data obtained during the past year from field tests of wire and wire products at eight widely scattered industrial, seacoast, and rural locations.

6B-103. Report of Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel, and Related Alloys. *American Society for Testing Materials*, Preprint 7, 1949, 8 pages.

Recommendations plus report of special committee on inspection of stainless-steel architectural structures to determine corrosion resistance in service.

6B-104. Results of Some Plant Corrosion Tests of Welded Stainless Steels. George F. Comstock. *American Society for Testing Materials*, Preprint 23, 1949, 10 pages.

Tests were made in a number of chemical plants under operating conditions, and results compared with those obtained by the boiling-HNO_3 procedure in the laboratory. The specimens included types 304, 321, and 347 sheets, welded with types 308, 321, and 347 electrodes, respectively, and tested both in the as-welded and stress-relieved conditions. Results show no correlation between the HNO_3 test and the plant tests.

6B-105. Electrochemical Studies on Insulating Couplings for Underground Pipe and Cable Lines. W. Beck. *Corrosion*, v. 5, June 1949, p. 175-181.

Resistance measurements were carried out on a number of the above immersed for about a year in tap water and under a constant polarizing emf. Application in connection with surface insulation, which is recommended to subdue stray current and cathodic corrosion. 16 ref.

6B-106. Corrosion Problems in a Fluid Catalytic Cracking and Fractionating Unit. Nathan Schofer. *Corrosion*, v. 5, June 1949, p. 182-188.

With particular reference to hydrogen blistering.

6B-107. Rectifiers and Galvanic Anodes for Cathodic Protection. A. L. Stegner. *Pipe Line News*, June 1949, p. 18-19, 22-23.

Two types of protection as applied to buried metallic structures, and their advantages and disadvantages under various circumstances.

6B-108. Boiler Water Conditioning and Chemical Cleaning of Boilers. S. S. Tomkins. *American Gas Association, Proceedings*, 1948, p. 488-504.

Use to prevent adherent solid deposits; corrosion, embrittlement, or other surface deterioration; and foaming or priming. Control measures include degasification and chemical treatment of feed water; removal of insoluble solids and excess soluble compounds from boiler; and separating water from steam.

6B-109. Complete Corrosion Tests on Iron and Steel Pipes. G. A. Ellinger, L. J. Waldron, and S. B. Marzolf. *Industry and Power*, v. 57, July 1949, p. 91-92.

Investigations that have extended over a period of 10 years on the relationship of pit depths and weight losses in pipes exposed to continuous water flow. Various steels, wrought irons, and cast irons were studied.

6B-110. Recent Research on Caustic Cracking in Boilers. C. D. Weir. *Transactions of the Institution of Engineers & Shipbuilders in Scotland*, v. 92, Jan. 1949, p. 165-191; discussion, p. 191-192, also Feb. 1949, p. 193-205.

Characteristics of caustic cracking; influence of feed water; apparatus and methods for caustic-cracking research; factors tending to stimulate and to inhibit caustic cracking; and theories of caustic cracking. 40 ref.

6B-111. Field and Laboratory Tests of Sodium Chromates and Alkalies for

Controlling Corrosion in Gas Condensate Wells. Part 1. The Problem and a Résumé of Results Obtained. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, July 1949, p. 142-144, 146, 148, 150.

First of a series of six articles describing work done by the Bureau of Mines in East Texas and Northeast Louisiana fields and in the laboratory.

6B-112. Modern Protection Methods for Cast Iron and Steel Pipes and the Experience Gained in the Netherlands. J. E. Carriere. *Gas Times,* v. 59, June 24, 1949, p. 478-480.

Summarizes a discussion by various men.

6B-113. Special Anodes for the Cathodic Protection of Water Tanks. A. L. Kimmel. *Corrosion,* v. 5, July 1949, p. 217-220.

Mechanism for film formation. Experimental work and results.

6B-114. The Role of Adsorption From Solution in Corrosion Inhibitor Action. Norman Hackerman and Harold R. Schmidt. *Corrosion,* v. 5, July 1949, p. 237-243.

A generalized theory for the mechanism of organic corrosion inhibitors. In experimental investigations, adsorption isotherms were run at 40° C. for stearic acid, stearyl alcohol, succinimide, dibutyl thiourea, and p-aminobiphenyl, using two different methods. 22 ref.

6B-115. New Aspects of Rustproofing. Arthur Minich. *Paint and Varnish Production Manager,* v. 29, July 1949, p. 185-190.

Previously abstracted from *Paint, Oil and Chemical Review.* See item 6B-69, 1949.

6B-116. Corrosion Protection for Tanks by Reinforced Gunite Linings. *Petroleum Processing,* v. 4, July 1949, p. 784-788.

Reinforcing with steel mesh in the application of guniting has proved to be successful for protecting storage tanks from corrosion, and overcoming spalling which occurred when a thinner, non-reinforced gunite lining was used. Details of installation.

6B-117. How to Select Anode Materials for Cathodic Protection Against Corrosion. N. Bruce Bagger. *Materials & Methods,* v. 30, July 1949, p. 47-49.

General factors involved, and the specific materials magnesium, aluminum, steel, and iron.

6B-118. High-Duty Silicon Iron; Components of Resistant Chemical Equipment. R. V. Riley. *Chemical Age,* v. 61, July 2, 1949, p. 21.

Corrosion-resistant properties; foundry technique; testing; and applications.

6B-119. Protection Methods for Cast Iron and Steel Pipes. J. E. Carriere. *Gas Journal,* v. 259, July 6, 1949, p. 96-97; discussion, p. 97-99.

Reviews communication No. 13 of the Central Corrosion Committees of the Netherlands. Light, reinforced, heavy, and very heavy external protection.

6B-120. The Economics of Oil-Well Corrosion Control. Robert J. Villagrana and William W. Messick. *Oil and Gas Journal,* v. 48, July 21, 1949, p. 58-61, 92-94.

Technology and economic factors. Indicators which may be used to predict corrosiveness. Types of well corrosion, effects of stray currents, cost evaluation, corrosion-mitigation methods and maintenance of a corrosion-control program.

6B-121. Isotherms at 100° C. of the System: MnO-P_2O_5-H_2O. (In Russian.) S. S. Taperova and M. M. Isaeva. *Zhurnal Prikladnoi Khimii,* (Journal of Applied Chemistry), v. 22, Apr. 1949, p. 342-353.

Investigated because of its importance in connection with phosphating for corrosion protection of ferrous metal. 30 ref.

6B-122. Sodium Nitrite as an Inhibitor Against the Attack of Sea Water on Steel. Part I. The Influence of Sodium Nitrite on the Area and Intensity of Attack. D. Wyllie and G. C. N. Cheesman. *Journal of the Society of Chemical Industry,* v. 68, June 1949, p. 165-168.

The above was studied by observation of the extent and nature of corrosion of mild-steel specimens partially immersed in sea water containing nitrite and by measurement of the corrosion currents using a divided cell. Appearance of a widespread brown discoloration at higher nitrate concentrations and a catalytic mechanism for the inhibiting action of nitrite. Effect of mixing phosphates and nitrite.

6B-123. The Practical Problems of Corrosion. Part XII. The Influence of Corrosion on the Thermal Deposition of Calcium Carbonate. J. N. Wanklyn and U. R. Evans. *Journal of the Society of Chemical Industry,* v. 68, June 1949, p. 171-173.

Steel specimens partly immersed in calcium bicarbonate solution develop a white band of calcium carbonate along the waterline. When more deeply immersed, the distribution of the $CaCo_3$ deposited is almost unrelated to that of the $CaCo_3$

produced in the previous corrosion stage. The corrosion product contained calcite and aragonite, and the thermal deposit only aragonite.

6B-124. Hydrogen Blistering of Steel; A Source of Damage to Vessels. M. H. Bartz and C. E. Rawlins. *Petroleum Processing,* v. 4, Aug. 1949, p. 898-901, 904-906.

The cause of blistering of vessel walls and other refinery equipment was found to be the attack of atomic hydrogen released by acid corrosion. This same condition may lead to embrittlement particularly at high temperatures. Use of corrosion-resistant linings is recommended as one means of controlling hydrogen blistering. Case histories from various refineries. 20 ref.

6B-125. Practical Corrosion Control on Gas Transmission Lines. G. R. Olson and H. V. Beezley. *Corrosion,* v. 5, Aug. 1949, p. 249-253.

Emphasis on the various forms of cathodic protection and on selection of type of current source. Importance of insulating couplings.

6B-126. Application of Alloy Steel Linings to Tanks Storing Corrosive Pulp Cooking Liquor. H. A. Schmitz and M. A. Scheil. *Corrosion,* v. 5, Aug. 1949, p. 271.

Test results. Types 347 and 316 low-carbon alloys were found to have considerable advantage over other materials tested.

6B-127. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part II. Theoretical Considerations. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, Aug. 1949, p. 173-174, 176, 177-178, 182.

The pH of compound found in well water, molecular forms of chromates, reduction of chromates, and test results. 28 ref.

6B-128. Kinetics of the Corrosion Process in Condensate Gas Wells. Norman Hackerman and Harold R. Schmidt. *Industrial and Engineering Chemistry,* v. 41, Aug. 1949, p. 1712-1716.

Rate curves for the corrosion of SAE 1020 steel in a number of natural gas-condensate wells were obtained for relatively long periods of time. Surfaces were examined microscopically and composition of the corrosion products was determined by X-ray and diffraction methods.

6B-129. Identification of Corrosion Products Using Measurements of Film Thickness and Mass. C. Kenneth Eilerts. *Industrial and Engineering Chemistry,* v. 41, Aug. 1949, p. 1716-1717.

The data of Hackerman and Schmidt (see above abstract) suggest that products of corrosion may be partially identified by the density of the surface layers. Data calculated indicate close agreement between measured values of corrosion-product density and the literature values for products identified by X-ray analysis.

6B-130. Use of Neutralizing Agents for Condensate-Well Corrosion Control. D. A. Shock. *Oil and Gas Journal,* v. 48, Aug. 11, 1949, p. 77-80.

Apparatus for pH determination in H_2CO_3 solutions. Test results showed that pH could be maintained above 5.5 by addition of neutralizing agents, even in the presence of large CO_2 excesses. Use of Mg metal was found to reduce attack of CH_3COOH and H_2CO_3 on steel. Injection of NO_2CO_3 into a corrosive well was shown to keep the water above pH 6.0 at well-head conditions. Corrosion of the tubing thus protected was negligible.

6B-131. Corrosion Protection of Oil-Refining Equipment. Henry P. Zeh. *Oil and Gas Journal,* v. 48, Aug. 11. 1949, p. 99-100, 103.

How to prepare condensed records of corrosion experience, how to determine corrosion rates by use of "reference points" consisting of noncorroding alloy blocks installed in fixed positions close to the surfaces being studied. Use of pilot-plant corrosion tests.

6B-132. Die Lokalelementwirkung bei der Eisen-Auflösung in Salzsäure. (The Galvanic Cell Effect of Dissolving Iron in Hydrochloric Acid.) II. K. Wickert and H. Pilz. *Archiv für Metallkunde,* v. 3, June 1949, p. 214-221.

Experiments made to produce galvanic iron-electrolyte vs. copper cells in metal powders and to measure the rate of solution of these powders in HCl.

6B-133. Praskani mekke oceli vlivem mezikrystalicke korose v roztocich dusicnanu amonneho. (Intergranular Corrosion Cracking of Mild Steel by Ammonium Nitrate Solutions.) M. Smialowski, B. Kopec, and J. Michalik. *Hutnické Listy,* v. 4, Mar. 1949, p. 70-79.

See abstract from *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), item 6B-100, 1949.

6B-134. The Breakdown and Repair of Oxide Films on Iron. T. P. Hoar.

Transactions of the Faraday Society, v. 45, July 1949, p. 683-693.

Influence of the film-rupturing anions chloride and perchlorate, and the film-repairing anions carbonate, nitrite, and chromate. Film breakdown is often preceded by partial repair. The nature and production of pores. An analogy between the electrolytic properties of oxide films and paint films is pointed out. 27 ref.

6B-135. Acid-Resisting Silicon Iron. R. V. Riley. *Foundry Trade Journal,* v. 87, Aug. 18, 1949, p. 221-224.

Corrosion resistant properties, foundry procedures, and applications.

6B-136. Corrosion of Steel in Sulfur-Producing Tubes; Frasch Process. D. A. Shock and Norman Hackerman. *Industrial and Engineering Chemistry,* v. 41, Sept. 1949, p. 1974-1977.

Coupons were exposed in the flow line from a sulfur well. Rates of corrosion were found to vary with variation in production conditions. The rate was negligible in the presence of sulfur alone but increased tremendously during water contacting periods in the presence of sulfur. Rate and nature of attack were reproduced in the laboratory in a simple bomb reactor.

6B-137. Corrosion. Mars G. Fontana. *Industrial and Engineering Chemistry,* v. 41, Sept. 1949, p. 73A-74A.

Boiling 65% HNO_3 test to predict corrosion of stainless steel in other environments. Doubtful value of this test.

6B-138. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 3. Maximum and Minimum Requirements of Sodium Chromate Determined. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, Sept. 1949, p. 156, 158, 160-162, 164, 168.

Results of Bureau of Mines tests in the Cotton Valley field.

6B-139. Activité électrochimique des pellicules de rouille et la corrosion du fer par la rouille en milieu humide aéré, voisin de la neutralité. (Electrochemical Activity of the Rust Film and Corrosion of Iron by Rust in a Moist, Aerated, Approximately Neutral Medium.) E. Herzog. *Métaux & Corrosion,* v. 24, May 1949, p. 119-134.

Corrosion of iron is initially caused by the difference in oxygen content followed by a cathodic effect pertaining to rust and oxygen. Thus, both of these agents activate the depolarization. 16 ref.

6B-140. Die Lokalelementwirkung bei der Eisenauflösung in Salzsaure. (The Local Cell Effect of the Solution of Iron in Hydrochloric Acid.) K. Wickert and H. Pilz. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 207-216.

Conflicting reports (by Todt, Evans, and Wickert) on the solubility of Fe in HCl induced the authors to study the effect of surface roughness on solubility.

6B-141. Eine unzweckmässige Anwendung von Chromstahl in der Praxis. (An Improper Practical Use of Chromium Steel.) W. Katz. *Metall,* July 1949, p. 222-223.

Why Cr steel, because of its tendency towards intercrystalline corrosion, is not a suitable material for industries working with the chlorine salts of the alkali and alkaline earth metals.

6B-142. An Inhibitor of Pitting in 18-8. A. Sourdillon. *Metal Progress,* v. 56, Sept. 1949, p. 356.

Asks for information concerning above for use to prevent pitting of stainless steel tank cars used to transport milk. The pitting is caused by use of a bactericidal solution of alkaline hypochlorite and sodium chloride. Some test results in which sodium silicate seemed to prevent corrosion.

6B-143. Further Field-Test Results on Use of Corrosion Inhibitors for Secondary Flood Waters. E. T. Heck, J. K. Barton, and W. E. Howell. *Oil and Gas Journal,* v. 48, Sept. 8, 1949, p. 83, 85, 89, 91, 94.

Earlier work indicated rosin amine D acetate was an effective bactericide and fungicide. Investigation of this and similar substances was extended to determine effect on growth of organisms in the water systems.

6B-144. Corrosion Control. *Oil and Gas Journal,* v. 48, Sept. 15, 1949, p. 107-109, 112, 114-115.

Experiences with a variety of inhibitors at West Tuleta gas field, Texas. A semipolar organic reagent used to coat the pipe and its application by injection.

6B-145. Corrosion of Mild Steel by Sulphuric Acid. H. R. Archer and J. Howlett. *Chemistry & Industry,* Aug. 27, 1949, p. 605-607.

Experimental results for 95 and 98% H_2SO_4.

6B-146. Corrosion of Iron and Steel by Industrial Waters and Its Prevention. *Iron and Steel Institute* (London), Special Report No. 41, Mar. 1949, 56 pages.

Illustrated survey. 99 ref.

6B-147. An X-Ray Study of the Scale

Formed on Iron Between 400 and 700° C. O. A. Tesche. *American Society for Metals,* Preprint No. 12, 1949, 9 pages.

Scales formed on oxidation for 15 min. over the above temperature range were studied. Fe_3O_4 is the only oxide formed up to 625° C. At 650-700° C. a double-layered scale was found, FeO lying next to the metal with an overlay of Fe_3O_4. 20 ref.

6B-148. Stress-Corrosion in a Stainless Steel Compressor. Frank W. Davis. *American Society for Metals,* Preprint No. 27, 1949, 19 pages.

Describes the above illustrated by stress corrosion of two rotors. The unit was used to compress steam. Chlorides were contained in both the raw-water supply and leachings from parts of the failed unit but the condensate produced contained less than 0.5 ppm. solids. Excessive dynamic stresses were imposed by mechanical removal of unequal lengths from all vane tips. Changes in design and operation have been made. Several of the new units have been in service for over a year without trouble.

6B-149. Sodium Nitrite as an Inhibitor Against the Attack of Sea Water on Steel. Part II. The Addition of Other Inhibitors to Nitrite. D. Wyllie and G. C. N. Cheesman. *Journal of the Society of Chemical Industry,* v. 68, July 1949, p. 209-212.

Efficiency and probable mode of action of phosphates, carbonates, sulfates, and Zn salts. 10 ref.

6B-150. Corrosion of Turbine Journals. S. E. Bowrey. *Journal of the American Society of Naval Engineers,* v. 61, Aug. 1949, p. 664-682. Reprinted from *Institute of Marine Engineers, Transactions,* v. 61, 1949.

Several wartime cases of corrosion in marine turbines. Possible causes and preventive measures. Laboratory work and practical trials showed value of sodium nitrite as a corrosion inhibitor. Recommended concentrations and methods of use.

6B-151. Annual Rust and Corrosion Loss. Rogers Clark. *Sheet Metal Worker,* v. 40, Sept. 1949, p. 40-41, 43.

Development of fish oil as a primer coat to prevent corrosion.

6B-152. Engineering Aspects of Cathodic Protection as Applied to Pipe Lines. E. P. Doremus, G. L. Doremus, and M. E. Parker. *Corrosion,* v. 5, Sept. 1949, p. 273-281.

Designing for complete protection.

6B-153. The Cathodic Protection of Steel Piling in Sea Water. H. A. Humble. *Corrosion,* v. 5, Sept. 1949, p. 292-300; discussion, p. 300-302.

Applications where varying conditions of exposure and nonuniform corrosion attack are encountered.

6B-154. A Method for Activating Stainless Steel Specimens Prior to Corrosion Tests. R. O. Bayer and E. A. Kachik. *Corrosion,* v. 5, Sept. 1949, p. 308-310.

In corrosion testing the austenitic stainless steels, it often happens that some of a group of apparently identical specimens, under the same conditions, will corrode while others will not. This behavior is termed borderline passivity. Procedure for ensuring that all specimens are initially active involves pickling just prior to introduction into the corrosive medium.

6B-155. Erkenntnisse über das Rosten und den Rostschutz von Eisen und Stahl (1946 und 1947). (Information on Rusting and Rust Protection of Iron and Steel, 1946 and 1947.) Heinrich Steinrath. *Stahl und Eisen,* v. 69, July 21, 1949, p. 528-531.

First part of a review of the literature. 52 ref. (To be continued.)

6B-156. Electrochemical Behavior of Zinc and Steel in Aqueous Media. R. B. Hoxeng and C. F. Prutton. *Corrosion,* v. 5, Oct. 1949, p. 330-338; discussion, p. 338.

Progress report of an investigation, resulting from the failure of galvanized pipe, to determine the effect of electrolyte composition and temperature on the electrochemical relationship between zinc and steel in natural and industrial waters. Results show that electrolyte composition is of even more importance than temperature. 14 ref.

6B-157. Deterioration of Steel Sheet Pile Groins at Palm Beach, Florida. Culbertson W. Ross. *Corrosion,* v. 5, Oct. 1949, p. 339-342.

Groins are used to prevent the motion of sand along the beach. Tests showed that deterioration was caused by the abrasive action of sand carried by waves.

6B-158. A Note on the Effect of Variations of Exposed Area on the Solution Potential and Corrosion Rate of Low Carbon Steel. J. M. Bialosky. *Corrosion,* v. 5, Oct. 1949, p. 346-349; discussion, p. 349.

Solution potential and weight losses were measured. Tests were conducted in a circular path apparatus with aerated 3.5% salt solution as the corroding medium. The concentration of the corroding solution, temperature, aeration, solution volume, and velocity were controlled.

6B-159. High Speed Stress and Corrosion Tester Developed for Oil Well

Drill Pipe. *Corrosion,* v. 5, Oct. 1949, p. 354.

Full-sized specimens are tested from brines in a machine developed by U. S. Steel Corp., National Tube Co.

6B-160. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 4. Tests of Mixtures of Sodium Chromate and Sodium Hydroxide. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, Oct. 1949, p. 174, 176, 178, 180.

6B-161. Mitigation of Corrosion of Bare Pipe Lines by Application of Magnesium Anodes. Robert L. Bullock. *Oil and Gas Journal,* v. 48, Oct. 6, 1949, p. 267-268, 271-272.

New method of cathodic protection of old, bare pipelines.

6B-162. The Effect of Oxygen on Inhibition of Corrosion by Nitrite. Morris Cohen, Rowena Pyke, and Paul Marier. *Journal of the Electrochemical Society,* v. 96, Oct. 1949, p. 254-261.

Effects of concentration of dissolved oxygen and temperature on rate of breakdown of sodium nitrite in the presence of steel, and on rate of corrosion of the steel. At any given temperature, increase in concentration of oxygen decreased the amount of nitrite required for inhibition.

6B-163. Metallurgical Aspects of Heat Checking in Brass Die Casting Dies. Part I. A. E. Nehrenberg. *Die Castings,* v. 7, Oct. 1949, p. 30-34, 36, 75-77.

Heat treatment, properties and structure of steel dies were investigated in relation to heat checking resulting from pressure brass die casting. (To be continued.)

6B-164. The Mechanism of Inhibition of Corrosion of Iron by Chromic Acid and Potassium Chromate. J. E. O. Mayne and M. J. Pryor. *Journal of the Chemical Society,* July 1949, p. 1831-1835.

Proposes that the iron ions are oxidized, while still in the solid lattice, to γ-ferric oxide, which forms a thin continuous film on the iron. This film is impervious to iron ions, and thus corrosion is prevented.

6B-165. The Passivity of Metals. Part IX. The Solubility Product of Freshly Precipitated Ferric Hydroxide. U. R. Evans and M. J. Pryor. *Journal of the Chemical Society,* Suppl. issue no. 1, 1949, p. S157-S160.

Solubility product was determined by an electrometric method. This quantity is of interest in the study of certain corrosion reactions.

6B-166. Erkenntnisse über das Rosten und den Rostschutz von Eisen und Stahl (1946 und 1947). [Rusting and Rust Prevention of Iron and Steel (1946 and 1947).] Heinrich Klas. *Stahl und Eisen,* v. 69, Aug. 18, 1949, p. 610-612; Sept. 1, 1949, p. 636-639; Sept. 15, 1949, p. 678-681.

Literature review. Aug. 18: soil and water corrosion, hot-water corrosion, steam-boiler corrosion. Sept. 1: rust prevention by metallic coatings. Sept. 15: use of nonmetallic inorganic and organic coatings. 228 ref.

6B-167. Behavior of Experimental Zinc-Iron Couples Under-Ground. I. A. Denison and W. Romanoff. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 144-152, 155-157; discussion, p. 152-154.

Field tests made by the National Bureau of Standards to study the effectiveness of Zn for the cathodic protection of iron and steel in different soil environments. 13 ref.

6B-168. Anodic Behavior of Zinc and Aluminum-Zinc Alloys in Sea Water. Thomas P. May, George S. Gordon, and S. Schuldiner. *National Association of Corrosion Engineers,* "Cathodic Protection; A Symposium", 1949, p. 158-170; discussion, p. 170-171.

Use for the cathodic protection of steel. 16 ref.

6B-169. Pickling Equipment for Severe Corrosive Conditions. Clarence B. Mitchell. *Iron Age,* v. 164, Nov. 3, 1949, p. 92-93.

Use of an unusual combination of five different alloys yields maximum strength and corrosion resistance at minimum cost. Hastelloy alloys B and C were used in the hooks, and the bars were made of Hastelloy Alloy B and SAE 4340 and 1035 steels. Parts were assembled by welding.

6B-170. Experience and Economic Benefits From Cathodic Protection on Gas Distribution Systems. A. W. Peabody and C. L. Woody. *Corrosion,* v. 5, Nov. 1949, p. 369-376.

6B-171. Electrolytic Corrosion of Steel in Concrete. G. M. Magee. *Corrosion,* v. 5, Nov. 1949, p. 378-380; discussion, p. 380-382.

Corrosion in the concrete footings for the steel structures of electric railways. Test installation; effects of various preventive measures and variations in concrete mix.

6B-172. Corrosion in Petroleum Processes Employing Aluminum Chloride. R. S. Treseder and A. Wachter. *Corrosion,* v. 5, Nov. 1949, p. 383-391; discussion, p. 391.

Many petroleum processes use

either of two types of anhydrous liquid catalysts containing aluminum chloride with hydrogen chloride present as catalyst promoter. For the $AlCl_3$-hydrocarbon type, 0.4% $SbCl_3$ has given satisfactory inhibition in one process. The $AlCl_3$-$SbCl_3$ type is less corrosive, but in some cases corrosion-resistant alloys are required. Factors affecting both types of corrosion and probable mechanisms.

6B-173. Attack of Hydrogen-Nitrogen Mixtures on Steels at 13,000 to 15,000 Pounds Per Square Inch Pressure and 204° to 593° C. Harry K. Ihrig. *Industrial and Engineering Chemistry,* v. 41, Nov. 1949, p. 2516-2521.

It is believed that austenitic Cr-Ni stainless steels are best for use at high pressures of hydrogen and nitrogen. However, it is recommended that samples of these steels be removed after periods of operation to determine whether attack has been progressive.

6B-174. Methods of Prevention and Removal of Corrosion From Steel Structures. W. C. Harman, M. Block, and W. K. Manning. *Railway Engineering and Maintenance,* v. 45, Nov. 1949, p. 1086-1087; discussion, p. 1087-1088.

Advantages and disadvantages of the different methods, including use of corrosion resistant metals.

6B-175. Use of Ammonia in Control of Vapor-Zone Corrosion in Storage Tanks. F. T. Gardner, A. T. Clothier, and F. Coryell. *Oil and Gas Journal,* v. 48, Nov. 10, 1949, p. 238, 241-242, 245-246. Ammonia Used to Control Vapor Zone Corrosion (a condensation), *Petroleum Engineer,* v. 21, Nov. 1949, p. D18, D20.

Results of several years' experience. Includes laboratory work and field tests.

6B-176. Cathodic Protection in an Oil Refinery. Derk Holsteyn. *Oil and Gas Journal,* v. 48, Nov. 10, 1949, p. 319-320, 323-324, 327-328, 330.

System which has proved practical and economical on bare networks of pipe lines and storage-tank bottoms found in an oil refinery.

6B-177. External Corrosion of Furnace-Wall Tubes. III. Further Data on Sulphate Deposits and the Significance of Iron Sulphide Deposits. R. C. Corey, G. A. Grabowski, and B. J. Cross. *Transactions of the American Society of Mechanical Engineers,* v. 71, Nov. 1949, p. 951-962; discussion, p. 962-963.

Extended studies begun in 1942 show that liquid alkali-metal pyrosulfates can be formed under operating conditions from deposits of alkali-metal sulfates on the tubes. Rate of attack will be considerably higher than when the sulfates, or "enamel" deposits, do not form a liquid phase. Phase boundaries for three compositions were established. Conditions for thermal decomposition of coal ash, leading to formation of the SO_3 necessary for the corrosion process, were determined.

6B-178. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 5. Analysis of Field Test Results. C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, Nov. 1949, p. 156-158, 162, 164, 166, 168, 170.

(To be concluded.)

6B-179. Mesures électrochimiques de la corrodabilité des alliages ferreux. (Electrochemical Determination of Corrodibility of Ferrous Alloys.) Leo Cavallaro and Antonio Indelli. *Métaux & Corrosion,* v. 24, June 1949, p. 149-156.

A relationship was experimentally established between weight loss and electrochemical data for a series of alloy steels in different electrolytes, using different inhibitors. Results show the possibility of electrochemical determination of corrodibility in different media. 40 ref.

6B-180. Adsorption Passivation of Iron by Protein Films. (In Russian.) G. S. Koshurnikov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, July 1949, p. 698-702.

Gelatin-nitrophenol adsorption layers passivate iron in the presence of acid solutions. Casein-phosphate adsorption layers passivate it not only in the presence of acid but also in the presence of aggressive salt media. 10 ref.

6B-181. Corrosion par discontinuité superficielle des alliages de métaux ferreux. (Expériences.) (Experiences With Corrosion of Ferrous Metals Caused by Surface Irregularities.) R. Binaghi. *Métaux & Corrosion,* v. 24, Sept. 1949, p. 216-222.

Experimental investigation of 10 alloy steel and 14 toolsteel specimens of varied composition. Effects of composition, heat treatment, passivation, and discontinuity of conditions. 16 ref.

6B-182. Das elektrochemische Verhalten und die Bildungsgeschwindigkeit von Oxydhäuten auf Metalloberflächen, insbesondere Eisen. (The Electrochemical Behavior and the Rate of Formation of Oxide Films on Metal Surfaces, Especially Iron.) Fritz Tödt. *Metalloberfläche,* v. 3, sec. A, Sept. 1949, p. A170-A173.

Electrochemical and chemical methods of determining the thickness of oxide films on iron and other metal surfaces as well as the rate of formation of iron oxide films. Quantitative comparison with the rate of formation of halide films. Measurements show considerable differences in galvanic effects between the oxide film and the exposed surface of pure metallic iron, soft iron, and hard iron.

6B-183. Correlation Between Corrosion Survey Results and Actual Conditions as Determined Through 130 Miles of Continuous Reconditioning. I. B. Tietze. *Corrosion,* v. 5, Dec. 1949, p. 409-415.

Results obtained on a petroleum-products pipeline.

6B-184. Cathodic Protection of Marine Tractor. Oliver Osborn. *Corrosion,* v. 5, Dec. 1949, p. 416.

6B-185. Marine Boiler Deterioration. I. G. Slater and N. L. Parr. *Corrosion,* v. 5, Dec. 1949, p. 417-434.

See abstract of condensed version from *Engineer,* item 6B-47, 1949.

6B-186. Field and Laboratory Tests of Sodium Chromates and Alkalies for Controlling Corrosion in Gas Condensate Wells. Part 6. (Concluded.) C. K. Eilerts, R. V. Smith, F. G. Archer, L. M. Burman, Faye Greene, and H. C. Hamontre. *World Oil,* v. 129, Dec. 1949, p. 160-162, 164, 166, 168.

Characteristics of a chromic oxide deposit found in the tubing collars of wells in the 3000-7100 ft. zone and also as a continuous internal coating below this level. Investigation of physical texture and composition, and solvent tests on this material indicate that 15% HCl will remove deposits of reduced chromates. Analysis of costs of chromate treatment.

6B-187. Corrosion and Incrustation in Return Systems. H. M. Schudlich, chairman. *American Railway Engineering Association,* Bulletin, v. 51, Nov. 1949, p. 150-154.

Causes and remedies for the above which occurs in steam-heating system return pipes.

6B-188. Corrosion Inhibitive Action of Zinc Compounds. J. E. O. Mayne. *Journal of the Society of Chemical Industry,* v. 68, Sept. 1949, p. 272-274.

Experimental results for three zinc dusts, three zinc oxides, other zinc compounds, and pigments based on Pb and Ti applied to steel. Zn dust provides cathodic protection, but ZnO does not.

6B-189. Les figures de corrosion dans les ferro-siliciums. (Corrosion Patterns in the Iron-Silicon Alloys.) A. Antonioli and A. Ferri. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 627-636; discussion, p. 636.

A new microscopic method for determination of the orientation of grains and for measurement of the electrolytic solution potential of monocrystals of different orientations. The alloy investigated contained about 4% Si. The possibility of explaining the corrosion pattern on the basis of the distribution of values of potential in grains of different orientations in polycrystalline materials is suggested. 25 ref.

6B-190. Über das anodische Verhalten des Eisens in Schwefelsäure. (The Anodic Behavior of Iron in Sulfuric Acid.) Ulrich Frohwalt Franck. *Zeitschrift für Naturforschung,* v. 4a, Aug. 1949, p. 378-391.

Electrochemical reactions of anodic passivation and activation of Fe in H_2SO_4. A proposed explanation of the anodic passivation mechanism is based on passivation time in relation to anodic current density and flow of the electrolyte. 33 ref.

6B-191. Zur Kenntnis des Angriffs von vanadiumhaltigen Oelaschen auf hitzebeständige Stähle. (The Attack of Vanadium-Containing Oil Residues on Heat Resistant Steels.) P. Schläpfer, P. Amgwerd, and H. Preis. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Oct. 1949, p. 291-299.

Experiments at 650-850° C. show that vanadium-containing fuel oils greatly accelerate the scaling of heat resistant steels if the temperature is above the melting point of the mineral residue, that the rate of attack increases with temperature, and that it is proportional to quantity of reacting material and to exposure time. Alkali in the residue also affects the rate of attack, but no attack occurs in a reducing atmosphere. Mechanism of attack.

6B-192. Mechanism of the Chromate Inhibition of Aqueous Corrosion of Iron. Influence of $K_2Cr_2O_7$ Additions to Water on the Electrode Potential of Iron. Influence of $K_2Cr_2O_7$ Additions to Water on the Rate of Electrode Processes. (In Russian.) I. L. Rozenfel'd and G. V. Akimov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 667-669; Aug. 11, 1949, p. 879-882.

Experimental results indicate that potassium dichromate, to a much higher degree than other inhibitors, causes displacement of the initial potential in the positive direction;

also that differences of electrode potentials of iron in plain water and in water containing $K_2Cr_2O_7$ increase considerably with time. These phenomena indicate that the mechanism of the action of dichromate consists of strong inhibition of the anodic process. The cathodic process is also inhibited; however, this effect is smaller than the anodic effect.

6B-193. Oxidation of Iron in the Range 100-400° C. Investigations at Cambridge. U. R. Evans. **Investigations at Teddington.** W. H. J. Vernon, T. J. Nurse, C. J. B. Clews, and E. A. Calnan. *Nature,* v. 164, Nov. 26, 1949, p. 909-911.

Results obtained independently at two British laboratories. Although the methods employed have been different, the two sets of results are essentially complementary.

6B-194. Corrosion Mitigation Within Dehydrating Tanks. Ernest O. Kartinen. *Oil and Gas Journal,* v. 48, Dec. 8, 1949, p. 82, 84.

Deals only with the most troublesome type of the above corrosion: that which occurs in the water-exposed areas of dehydrating tanks, and, to a lesser degree, in some stock tanks. Use of coatings and magnesium-anode systems. The latter are recommended.

6B-195. Influence of Oil in Subsurface Corrosion of Oil-Well Equipment. Walter F. Rogers. *Oil and Gas Journal,* v. 48, Dec. 15, 1949, p. 73-75, 79.

Ability of oils to wet steel in the presence of the water produced. Oils vary widely in their tendency to wet and protect steel. A method was developed for surveying tubing to determine the presence of oil films in place for the purpose of correlating oil drop-size ratio, surface oil films and corrosion history. Wetting agents are now being used commercially to develop surface oil films on steel and reduce corrosion rates.

6C—Nonferrous

6C-1. The Anodic Oxidation of Gold in Alkali Hydroxide Solutions. (In English.) F. Jirsa. *Collection of Czechoslovak Chemical Communications,* v. 13, Oct. 1948, p. 505-513.

The mechanism and chemistry of the above were studied experimentally. 14 ref.

6C-2. Studies in Electrolytic Polarisation. Part V. Hydrogen Overpotential in Methanolic Solution. J. O'M. Bockris and Roger Parsons. *Transactions of the Faraday Society,* v. 44, Nov. 1948, p. 860-872.

The hydrogen overpotential was determined for the metals Bi, Tl, Ag, Ta, C (filament), C (rod), W, Mo, Au, Pt, and Pd, in methanolic and aqueous acid solutions. The Tafel equation is generally applicable to the results except for those for Tl and Ag in aqueous solution. Some evidence is given that this is due to a poisoning effect. 33 ref.

6C-3. Corrosion des toitures en zinc. (Corrosion of Zinc Roofs.) Marcel Pourbaix. *Métaux & Corrosion,* v. 23, Oct. 1948, p. 215-225.

Rapid corrosion of a zinc roof; factors responsible; Methods of prevention.

6C-4. Dezincification. G. T. Colegate. *Metal Industry,* v. 73, Dec. 17, 1948, p. 483-485; Dec. 24, 1948, p. 507-509; Dec. 31, 1948, p. 531--533.

Susceptible types of alloys; factors causing dezincification; and forms of dezincification. Internal and external influencing factors. Mechanisms involved; accelerated tests for susceptibility to dezincification; occurrence in practice. 28 ref.

6C-5. Intercrystalline Failure of Brasses and Aluminum Brasses in Air, Ammonia, and Certain Aqueous Solutions and Molten Metals. Part III. Cast and Wrought Beta and Beta Plus Gamma Brasses, With and Without Aluminium. Part IV. Cast Beta Brasses With and Without Aluminium. Marjorie E. Whitaker. *Metallurgia,* v. 39, Dec. 1948, p. 66-70.

Experimental results obtained by E. Voce and A. R. Bailey are tabulated and illustrated. Includes summary and conclusions covering all four parts.

6C-6. Diffusion of Radioactive Copper During Oxidation of Copper Foil. Gilbert W. Castellan and Walter J. Moore. *Journal of Chemical Physics,* v. 17, Jan. 1949, p. 41-43.

Strips of copper foil were plated with radioactive Cu and oxidized in air at 800, 900, and 1000° C. From the distribution of radioactive Cu in the oxide, diffusion coefficients for cuprous ion in cuprous oxide were calculated. These measurements provide further evidence that diffusion of Cu^+ in Cu_2O is the rate-determining step.

6C-7. Recent Progress in Corrosion-Resisting Nickel-Base Alloy Castings. M. M. Hallett. *Nickel Bulletin,* v. 21, Nov. 1948, p. 154-156.

The Hastelloy series and their applications.

6C-8. Influence of Composition on the Stress-Corrosion Cracking of Some

Copper-Base Alloys. D. H. Thompson and A. W. Tracy. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 100-109.

Certain high-copper alloys are susceptible to season-cracking or stress-corrosion cracking; possible explanations. Sheet-metal specimens of Cu-base alloys were exposed to static tensile stresses of 5000-20,000 psi. and simultaneous contact with a continuously renewed atmosphere containing 80% air, 16% ammonia, and 4% water vapor at 35° C. Time-to-failure was the primary measure of results. Supplementary tests in the absence of stress using weight loss or microscopical appearance as measures of attack were made.

6C-9. Corrosion in Multiple Layer Wound Coils. Howard Orr. *Communications,* v. 29, Jan. 1949, p. 22-23.

Progress made in overcoming chemical, electrolytic, and galvanic corrosion, major cause of most open-circuit failures in coils. (To be continued.)

6C-10. The Corrosion of Zinc and Zinc-Coated Steel in Hot Waters. P. T. Gilbert. "Pittsburgh International Conference on Surface Reactions", 1948, p. 21-49.

Results of a study of the corrosion of zinc and galvanized steel in hard water and in some other solutions, at temperatures up to 85° C. The usual electrochemical relationship between zinc and steel is reversed under certain circumstances; conditions under which this reversal occurs were investigated. A theory of the corrosion of zinc and galvanized coatings in aqueous solutions. 24 ref.

6C-11. Mechanism of the Rapid Oxidation of High-Temperature, High-Strength Alloys Containing Molybdenum. W. C. Leslie and M. G. Fontana. "Pittsburgh International Conference on Surface Reactions", 1948, p. 173-186.

Previously abstracted from *American Society for Metals,* Preprint no. 26, 1948. See items 6c-37, 1948.

6C-12. How to Diagnose Bearing Failures. *SAE Journal,* v. 57, Mar. 1949, p. 68-69. Based on "Engine Bearing Failures," by J. M. Stokely.

Four-step procedure. Different types of bearing corrosion illustrated.

6C-13. On the Oxidation of Metals at Low Temperatures and the Influence of Light. N. Cabrera. *Philosophical Magazine,* ser. 7, v. 40, Feb. 1949, p. 175-188.

Mott's theory is extended to oxides, such as Cu_2O, for which the metal diffuses through the oxide by the mechanism of vacant lattice points. It is also proved that the logarithmic law is valid down to very low temperatures and for pressures of oxygen above about 10^{-4} mm. Hg., independently of temperature and oxide considered. Mott's model is also applied to explanation of the influence of light on the oxidation of Al. 11 ref.

6C-14. Formation of Photographically Active Particles During Atmospheric Corrosion of Metals. (In Russian.) I. L. Roikh. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 119-122.

Experimental investigation of the kinetics of formation of the above during atmospheric corrosion of Mg, Al, and Zn. Interpretation of the results helps explain the mechanism of atmospheric corrosion.

6C-15. De la surtension de l'Hydrogene, en particulier sur le Nickel, le Tantale et le Niobium. (Overvoltage of Hydrogen, Particularly on the Surface of Nickel, Tantalum, and Columbium.) Eva Palmaer. *Journées des Etats de Surface,* 1946, p. 266-271.

Method and apparatus. Data obtained.

6C-16. The Relation of Composition to Stress-Corrosion Cracking in Copper Alloys. Maurice Cook. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 73-84; discussion, p. 398-431.

Copper can be regarded as free from liability to stress-corrosion cracking. The possibility of failure in service of Cu-Zn alloys is limited to alloys containing less than 80% Cu, and alloys containing less than 15% Zn are practically immune from season-cracking. Certain elements—including Si, P, As, Sb, and Mn—may improve resistance to stress-corrosion cracking. Similar data on the Al bronzes, cupro-nickels, Si bronzes, and nickel silvers. 40 ref.

6C-17. Measurements on the Oxidation-Resistance of High-Melting-Point Alloys. O. Kubaschewski and A. Schneider. *Journal of the Institute of Metals,* v. 75, Feb. 1949, p. 403-416.

Resistance to atmospheric oxidation of binary and ternary alloys was investigated at 1250° C. by means of special apparatus. X-ray and microscopic examinations and Brinell hardness measurements were also carried out, at room temperature, on alloys of chromium with tungsten and molybdenum. 12 ref.

6C-18. Oxidation-Resistance and Some Phase Relationships in the System Chromium-Tantalum-Nickel. O. Kubaschewski and H. Speidel. *Journal*

of the Institute of Metals, v. 75, Feb. 1949, p. 417-430.

Investigation using thermal, microscopic, and X-ray methods. Results of high-temperature oxidation tests on the systems Ni-Ta and Cr-Ta-Ni.

6C-19. Korrosionsuntersuchungen an Hartchromschichten. (Corrosion Tests on Hard Chromium Deposits.) Walter Eilender, Heinrich Arend, and Franz Sadrazil. *Metalloberfläche,* v. 3, Feb. 1949, p. 32-35.

The resistance of hard Cr is caused by its air passivation. Effects of surface condition, heat treating, nitrite, paraffin, and phosphate baths (both before and after the chromium plating operation) on the corrosive properties of Cr.

6C-20. Sur la dissolution du platine laminé dans l'eau régale. (Concerning the Dissolution of Platinum Foil in Aqua Regia.) Clément Courty. *Bulletin de la Société Chimique de France,* Nov.-Dec. 1948, p. 1152-1154.

Silver, gold, iridium, and copper impurities in polished platinum foil produce curious phenomena in the dissolution of the foil in aqua regia. Data concerning rates of dissolution.

6C-21. Corrosion of Base Metal Contact Surfaces in the Telephone System. *Corrosion,* v. 5, Apr. 1949, p. 134.

Method for minimizing this corrosion by use of a special lubricant composition. Comparative results with and without treatment.

6C-22. Prevention of Corrosion of Copper by Sulfur Compounds by Use of Anthraquinone. (In Russian.) L. G. Gindin and R. Kh. Sil's. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Dec. 21, 1948, p. 685-688.

Results of investigation established that certain hydrocarbons act as inhibitors in the process of copper corrosion by sulfur solutions. The best inhibitor was found to be 9,10-anthraquinone. Tests showed that 0.206% (by weight) of this substance protected a copper plate more than 200 days. It is believed that the corrosion inhibition is caused by adsorption of anthraquinone molecules by copper, thus preventing reaction with sulfur.

6C-23. The Mechanism of the Protection of Copper From Corrosion by Sulfur Solutions Using Anthraquinone. (In Russian.) Ya. I. Frenkel and L. G. Gindin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 1, 1949, p. 91-93.

Attempts to explain theoretically the phenomenon of passivation of Cu discovered by the authors, using a benzene solution of sulfur containing 9,10-anthraquinone.

6C-24. Hastelloy Alloys. C. G. Chisholm. *Chemical Engineering,* v. 56, Apr. 1949, p. 218, 220.

Behavior when used in contact with various strengths of HCl and over a range of temperatures.

6C-25. Stress Corrosion in Naval Brass Weldments. Bela Ronay. *Welding Journal,* v. 28, Apr. 1949, p. 358-363.

The cause of cracks emanating from the ends of fillet welds which join the brackets to the inside of the shells of batteries of salt-water evaporators. Recommendations concerning fabrication of naval brass by arc welding using phosphor-bronze electrodes.

6C-26. Engine Bearing Failures. J. M. Stokely. *SAE Quarterly Transactions,* v. 3, Apr. 1949, p. 319-326.

Previously abstracted from condensed version in *SAE Journal;* item 6C-12, 1949.

6C-27. Mechanism of the Copper and Halogen-Ion Catalysis of Dissolution of Copper. Zoltan Szabo. *Journal of the American Chemical Society,* v. 71, Apr. 1949, p. 1511.

6C-28. Ein Beitrag zur Korrosion des Zinns. (Research on the Corrosion of Tin.) Ludwig Werner Haase. *Metalloberfläche,* v. 2, Aug. 1948, p. 166-168.

Presents result of experiments.

6C-29. Uber den Einfluss von Zusätzen auf die Oxydation von Nickel und Chrom-Nickel-Legierungen. (The Effect of Additions on the Oxidation of Nickel and Chromium-Nickel Alloys.) Lore Horn. *Zeitschrift fur Metallkunde,* v. 40, Feb. 1949, p. 73-76.

Incorporation of a second metal into pure Ni reduces its oxidation resistance. But in Cr-Ni alloys, a third metal accelerates the diffusion of the Cr atoms and thus causes the rapid formation of a protective Cr-oxide film. Explanation given is based on fundamental structural factors.

6C-30. Les réactions accélératrices de la corrosion du plomb dans le ciment. (Reactions Accelerating the Corrosion of Lead Imbedded in Cement.) M. Dodero. *Métaux & Corrosion,* v. 24, Feb. 1949, p. 50-56.

Results of investigations. Very weak direct or alternating currents, as well as the thermoelectric current induced by contact with certain metals, may accelerate the corrosive effect of cement, resulting

in the formation of PbO. Strong electric currents may oxidize lead electrolytically, resulting in PbO_2.

6C-31. A Case of Corrosion Involving Cinders. C. H. Thompson. *Corrosion,* v. 5, May 1949, p. 151-154; discussion, p. 154.

Case of lead-cable corrosion at a point where the fill consisted of partly burned bituminous cinders. A gas main was adjacent, which resulted in setting up of an iron-carbon cell between the cinders and the gas main. Positive potentials thus generated caused the cable corrosion. It was necessary to remove the cinders completely, including scraping a 2-in. crust from the gas main; and to replace them with sand in order to remedy the condition.

6C-32. Preventing Corrosion in Relays. A. E. Herman. *Electrical Manufacturing,* v. 43, May 1949, p. 116-118.

In partially sealed, continuously operated relays, arcing at contacts may form nitric acid and ozone which attack metal parts and organic compounds. This type of corrosion was investigated experimentally. Results show need for ventilation of frequently operated relays to remove the corrosive atmosphere.

6C-33. Corrosion of Water Heaters by Flue Gases. Part 1. Effect of Temperature on the Corrosion of Tin-Lead Coatings. R. Kerr and Sonia M. Withers. *Journal of the Institute of Fuel,* v. 22, Apr. 1949, p. 204-208.

An apparatus in which the corrosion of solder-coated copper is determined under steady temperature conditions. Tests in which the composition of the flue gases is kept fairly constant, while the specimen temperature is varied from 38 to 125° C., using specimens coated with an alloy of 80% Pb and 20% Sn. Corrosion is at a maximum at the dew-point temperature of the flue gases, and at the temperature which would be the dew-point in the absence of SO_3.

6C-34. Effect of Non-Condensable Gases on Corrosion of Nickel in Steam Condensate. W. A. Wesley and H. R. Copson. *Journal of the Electrochemical Society,* v. 95, May 1949, p. 226-241.

Corrosive conditions of evaporator tubes on the steam side were simulated by tests in hot water saturated with mixtures of CO_2 and air under pressure. These showed that appreciable corrosion of nickel can occur from about 55-90% CO_2 by volume. In the presence of iron corrosion products, this range was broadened to about 40-90%. Corrosion can be prevented by removing air or CO_2 until their ratio is no longer critical. Inconel, tin, and stainless steel were resistant to attack under all experimental conditions. Zinc and some Cu alloys were also tested.

6C-35. The Testing of Metal Alloys at High Temperatures. C. L. Beuken and R. Czepek. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 256-262; discussion, p. 347-366.

Use of thermobalance method for determining oxidation resistance of metals at high temperatures. Test results on eight alloys, partly Cr-Ni and partly Cr-Fe-Al, are compared with those of standardized life-tests.

6C-36. Uber eine hochaluminiumhaltige Zinklegierung. V. Verhalten bei Einwirkung von Säuren. (A High-Aluminum Zinc Alloy. V. Behavior in Contact With Acids.) Erich Gebhardt. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 142-144.

Corrosion resistance of 32% Al, 3% Cu alloy with respect to acetic, sulfuric, nitric, and hydrochloric acids of varying concentration.

6C-37. Die Oxydationsgeschwindigkeit von Nickel. (The Rate of Oxidation of Nickel.) Oswald Kubaschewski and Ortrud v. Goldbeck. *Zeitschrift fur Metallkunde,* v. 39, May 1948, p. 158-160.

The author compares his results with those obtained by others. An effect of the purity of the nickel on its resistance to oxidation, and the probable effect of temperature on oxidation rate.

6C-38. Report of Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys. *American Society for Testing Materials,* Preprint 10, 1949, 26 pages.

Includes proposed revised tentative method of salt-spray (fog) testing (with appendix on design of apparatus); and paper, "Effect of Weather on the Initial Corrosion Rate of Sheet Zinc", by O. B. Ellis.

6C-39. Die Korrosion von Kupfer in technischen Salzlösungen. (The Corrosion of Copper in Commercial Salt Solutions.) W. Katz. *Metalloberfläche,* ser. A, v. 3, May 1949, p. 101-105.

The corrosion of Cu in solutions of $MgCl_2$, $MgSO_4$, HCl, and NaCl. In alkaline buffered solutions (not necessarily above pH 7), the Cu dissolves at a constant rate, whereas, in slightly acid solutions, it dissolves at an increasing rate.

6C-40. Metallic Alloys Stable in Hydrochloric Acid Media. (In Russian.) N. I. Gel'perin, Yu. P. Aronson, D. I. Drukarova, and T. S. Raitsina. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 45-55.

Use of "Hastelloy" A and B Ni-Mo alloys for construction of equipment for treatment of substances containing HCl, HBr, and HCOOH. Effects of exposure to these chemicals over a range of concentrations and temperatures.

6C-41. Investigation of the Corrosion of Galvanized Roofing Iron During Contact With Wet Construction Materials: Soil, Clay, and Sand. (In Russian.) A. V. Solov'ev. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Jan. 1949, p. 62-66.

Experimental data.

6C-42. Beständigkeit von Silber gegen Flusssäure. (Resistance of Silver to Hydrofluoric Acid.) Martha Gretchman and K. W. Fröhlich. *Chemie-Ingenieur-Technik,* v. 21, Feb. 1949, p. 68.

Results of experiments at temperatures of 18-115° C.

6C-43. (Book) **Panel Discussion on Influence of Non-Ferrous Metals and Their Compounds on Corrosion of Pressure Vessels.** American Society for Testing Materials, 1916 Race St., Philadelphia, Pa., 1949, 45 pages. $1.00.

Effect on corrosion of the deposition as sludges, or as metals, of non-ferrous metals and their compounds in pressure vessels. Consists of two papers: "Station Design and Material Composition as Factors in Boiler Corrosion", R. B. Conworth; and "Corrosion of High-Pressure Steam Generators: Status of Our Knowledge of the Effect of Copper and Iron Oxide Deposits in Steam Generating Tubes", Richard C. Corey.

6C-44. The Solution of Gold by Selenic Acid. William E. Caldwell and Lowell P. Eddy. *Journal of the American Chemical Society,* v. 71, June 1949, p. 2247.

Action of 87 and 97% solutions at 130° C.

6C-45. Bearing Corrosion Test for Lubricating Oils; Correlation With Engine Performance. E. C. Hughes, J. D. Bartleson, and M. L. Sunday. *Analytical Chemistry,* v. 21, June 1949, p. 737-743.

Describes thrust-bearing apparatus adaptable to the Sohio oxidation test. Operating conditions and catalyst components have been determined so that the test at 10 hours correlates for Cu-Pb corrosion with the 36-hour, L-4 Chevrolet test for varied groups of inhibitors and oils. The test is shown to be correlative for 76 oil-inhibitor combinations comprising four inhibitor types and two commercial oils. 14 ref.

6C-46. Destruction of an Admiralty Tube Bundle by Stress Corrosion in the Presence of Mercury. B. B. Morton. *Corrosion,* v. 5, July 1949, p. 244.

6C-47. The Oxidation of Copper and the Reactions of Hydrogen and Carbon Monoxide with Copper Oxide. W. E. Garner, T. J. Gray, and F. S. Stone. *Proceedings of The Royal Society,* ser. A, v. 197, June 22, 1949, p. 294-314.

Investigation made of the activation of Cu. Heats of adsorption of CO and O_2 and heat liberated during the catalytic reaction on a cuprous oxide film formed on Cu were measured at room temperature and the kinetics of the reactions were studied. Electrical conductivity of thin films of oxides during reduction and the process of embrittlement. Effect of adsorption of gases on surface conductivity. 20 ref.

6C-48. Oxidation-Resistance of High Melting Point Alloys. O. Kubaschewski and A. Schneider. *Canadian Metals and Metallurgical Industries,* v. 12, July 1949, p. 16-17, 22-23, 26, 28.

Previously abstracted from *Journal of the Institute of Metals.*

6C-49. Resistance of Monel, Nickel and High-Nickel Alloys to Corrosion by Sulfuric Acid. *International Nickel Co.,* Technical Bulletin T-3, Oct. 1948, 44 pages.

The performance in sulfuric acid solutions was determined by service experience and numerous laboratory and plant corrosion tests. 22 ref.

6C-50. La reduction des films minces d'oxyde de Cuivre. (Reduction of Thin Films of Copper Oxide.) W. E. Garner, T. J. Gray, and F. S. Stone. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D177-D182.

Copper oxide films were prepared by alternate oxidation and reduction. Changes taking place were followed by variation in gas pressure and electrical resistance, and by microscopic examination. Kinetics of the reaction were studied on the basis of heats of adsorption determined for O_2, CO, H_2, and CO_2.

6C-51. Structure et croissance des pellicules anodiques sur l'Aluminium et le Zinc. (Structure and Growth of Anodic Films on Aluminum and Zinc.) M. K. Huber. *Bulletin de la Société Chimique de France,* Mar.-

Apr. 1949, p. D183-D188.

Investigation revealed the existence of two types of anodic film on each of the above metals, a very dense film restricting the passage of the electrical current, and a porous film. The crystallographic structure of porous films and their optical properties seem to be related to the crystal structure of the metal substrate. 17 ref.

6C-52. Chemical Properties of the Intermetallic Compounds Mg_2Sn and Mg_2Pb. W. D. Robertson and H. H. Uhlig. *Journal of the Electrochemical Society,* v. 96, July 1949, p. 27-42.

Study of physical and chemical properties of the compounds undertaken to provide data concerning constitution, and also to provide a more complete understanding of corrosion mechanisms in alloys. Chemical properties reported include: oxidation rates at high and low temperatures, galvanic potentials, rates of reaction in inorganic electrolytes, and a previously unreported form of crystallographic disintegration, occurring in distilled water and having a possible relation to stress-corrosion cracking. 15 ref.

6C-53. Comparative Corrosion Resistance of Some Copper Alloy Condenser Tubes. John R. Freeman, Jr., and A. W. Tracy. *Corrosion,* v. 5, Aug. 1949, p. 245-248.

Results of experiments at a water-flow rate of 11.7 ft. per sec. show the marked superiority of the cupro-nickel alloys containing iron in resisting the rather extreme conditions of test. The effect of only 0.75% Fe in the 10% cupro-nickel alloy is particularly significant. This new alloy is also shown to be superior to 8%-Sn bronze.

6C-54. Physical and Corrosion Characteristics of Lead in the Chemical Industry. Kempton H. Roll. *Corrosion,* v. 5, Aug. 1949, p. 261-270; discussion, p. 270.

Based on information in the files of the Lead Industries Association. Amenability to various fabrication methods; applications. 18 ref.

6C-55. Titanium and Zirconium Corrosion Studies; Common Mineral Acids. E. A. Gee, L. B. Golden, and W. E. Lusby, Jr. *Industrial and Engineering Chemistry,* v. 41, Aug. 1949, p. 1668-1673.

Apparatus used and results obtained when Ti and Zr were exposed to the corrosive actions of various concentrations of H_2SO_4, HCl, and HNO_3 at different temperatures. Ti is resistant to H_2SO_4 and HCl only at low concentrations but is almost completely resistant to all concentrations of HNO_3. Its general behavior is comparable to Type 316 stainless steel. Zr is relatively resistant to all concentrations of HCl, HNO_3, and H_3PO_4, although it is attacked by high concentrations of H_2SO_4 at elevated temperatures. 10 ref.

6C-56. Kinetics of the Reactions of Zirconium With O_2, N_2, and H_2. Earl A. Gulbransen and Kenneth F. Andrew. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 515-525.

Studied as a function of time, temperature, pressure, surface preparation, and stability of the particular film. The vacuum microbalance method was used. 34 ref.

6C-57. Hydrofluoric Acid Versus Construction Materials. *Chemical Engineering,* v. 56, Aug. 1949, p. 233-234.

Part I of a symposium in which a representative group of construction materials is evaluated for services involving HF. Separate articles on "Carbon and Graphite", by J. F. Revilock; "Chlorimets", by Walter A. Luce; and "High-Silicon Irons", by Walter A. Luce.

6C-58. Corrosion in Multiple Layer Wound Coils. Howard Orr. *Communications,* v. 29, July 1949, p. 18-19.

Part II of report on progress achieved in overcoming electrolytic corrosion in multiple layer coils; tests used to determine characteristics of corrosion. (To be continued.)

6C-59. Corrosion in Multiple Layer Wound Coils. Part III. Procedures Involved in Evaluating Materials for Electrolytic Corrosion Characteristics; Calculating Corrosion Distribution. Howard Orr. *Communications,* v. 29, Aug. 1949, p. 22-23.

6C-60. Tensions internes, fissures dues aux tensions et destruction corrosive du laiton. . . . Eigenspannungen, Spannungsrisse und korrosiver Zerfall des Messings. (Internal Stresses, Tension Cracks, and Corrosive Decomposition of Brass.) R. Stettler. *Pro-Metal,* v. 2, June 1949, p. 406-412.

Causes of the spontaneous cracking of semi-finished and finished brass products were investigated. Effect of soldering and hot shortness on the propensity of brass and nickel-silver to cracking.

6C-61. Das Verhalten gepasteter Bleisammler während u. nach längerer Nichtbenutzung. (The Behavior of Paste-Coated Storage Battery Plates During and After Extended Periods of Non-Use.) E. Hoehne. *Archiv für*

Metallkunde, v. 3, May 1949, p. 185-191.

Results of an investigation with respect to corrosion and deterioration over periods of non-use up to 400 days.

6C-62. The Beaker-Corrosion Test for Lubricating Oils. F. W. H. Matthews. *Journal of the Institute of Petroleum*, v. 35, June 1949, p. 436-453.

A laboratory test for evaluating the corrosive potentialities of lubricating oils towards Cd-Ni bearing metal. Results correlating with those obtained by the Bristol single-cylinder Hercules engine.

6C-63. Porosity of Electrodeposited Metals. V. Measurement of the Corrodibility of Metal Foils. N. Thon, Denis Kelemen, and Ling Yang. *Plating*, v. 36, Sept. 1949, p. 928-929, 959.

A gas-permeability method used on electrolytic nickel foil produced from sulfate and chloride baths, wrought Ni foil, and electrolytic Cu foil from a sulfate bath. Corrosive media were vapor above a 3 *N* HCl solution; a moisture-saturated, 6 mole % SO_2 atmosphere, and a 5% NaCl solution.

6C-64. Electronographic Investigation of the Oxidation of Copper at Elevated Temperatures. (In Russian.) P. D. Dankov and D. V. Ignatov. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 234-237.

Structure of oxide films formed on a thick copper test specimen at 200° C. after different periods of exposure to the atmosphere. Mechanism of film formation. Includes diffraction patterns.

6C-65. Zum Mechanismus der Rissbildung bei der Spannungskorrosion homogener Mischkristalle. I. Die Ursache für das Auftreten inter- und transkristalliner Risse. (The Mechanism of Cracking in the Stress-Corrosion of Homogeneous Alloys. I. The Cause of Inter and Intracrystalline Cracks.) Ludwig Graf. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 275-280.

Research on Ag-Au and Cu-Au alloys shows that the type of cracking depends mainly on the nature of the stress-producing agent and that intracrystalline cracks can be caused only by highly oxidizing agents while intercrystalline cracks are caused by weak oxidizing agents. X-ray diagrams. 18 ref.

6C-66. Influence de la transformation ordre-désordre sur l'activité chimique des laitons. (Influence of the Order-Disorder Transformation on the Chemical Activity of β-Brass.) Georges Nury and Hubert Forestier. *Comptes Rendus* (France), v. 229, July 11, 1949, p. 123-124.

Investigated for β-brass containing 48% Zn up to about 460° C., by determining the change of rate of oxidation with temperature. Results for both α- and β-brass are charted.

6C-67. Chemical Reactions of Intermetallic Phases. I. Disintegration of the Intermetallic Compounds Ag_5, Al_3, Mg_2Pb. (In Russian.) E. E. Cherkashin, F. A. Derkach, and S. M. Przhevolotskaya. *Zhurnal Obshchei Khimii* (Journal of General Chemistry), v. 19 (81), May 1949, p. 798-804.

Cases of chemical reactions of intermetallic phases were investigated, in which metallic alloys in air, under ordinary conditions, disintegrate into powder. Nature of the chemical processes occurring. Factors influencing disintegration. Kinetics of such reactions as indicated by the curve of corrosion rate vs. time.

6C-68. The High Temperature Oxidation of Manganese. Raymond S. Gurnick and William M. Baldwin, Jr. *American Society for Metals*, Preprint No. 9, 1949, 12 pages.

Samples of easily maintained and accurately measured surface area were obtained by electroplating the metal on a tough backing. It was found that manganese obeys the Pilling and Bedworth parabolic law ($w^2 = Kt$, where w is weight increase due to fixation of oxygen, t is time, and K is a constant) when scaled in air from 400 to 1100° C. The scaling constant, K, was found to adhere to a single Arrhenius-type curve over the entire temperature range. The scale virtually consisted of Mn_3O_4 only up to 900° C. From this temperature on, MnO appeared in increasing proportion. Possible effect of MnO on scaling constant at higher temperatures. 13 ref.

6C-69. The Use of Selenium Rectifiers as One-Way Valves in Electrolysis Drainage Wires. W. D. Connon. *Corrosion*, v. 5, Oct. 1949, p. 315-318.

Anodic corrosion due to reversal of potential in trolley systems. Prevention methods.

6C-70. Corrosion Resistance of Commercially Pure Titanium. G. E. Hutchinson and P. H. Permar. *Corrosion*, v. 5, Oct. 1949, p. 319-324; discussion, p. 324-325.

Resistance to sea water, atmospheric corrosion, and selected chemical reagents was investigated. Good resistance to corrosion, coupled with excellent strength-weight properties,

indicates promising applications. 12 ref.

6C-71. High Temperature Scaling of Cobalt. Charley R. Johns and William Marsh Baldwin, Jr. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), Oct. 1949, p. 720-721.

Reviews previous work and reports results of an investigation on the discrepancies observed. 11 ref.

6C-72. Corrosion and Growth of Lead-Calcium Alloy Storage Battery Grids as a Function of Calcium Content. U. B. Thomas, F. T. Forster, and H. E. Haring. *Transactions of the Electrochemical Society*, v. 92, 1947, p. 313-325; discussion, p. 325.

Previously abstracted from Preprint 92-12. See item 6-281, 1947.

6C-73. The Corrosive Sulphur Test. G. Claxton and K. H. V. French. *Journal of the Institute of Petroleum*, v. 35, July 1949, p. 496-507.

Addition to the copper-strip test by which it is possible to study the corrosion of copper by motor fuels on a more quantitative basis than previously. This addition depends upon conversion of the sulfide stain on the strip into H_2S, which is estimated colorimetrically. The mutual activation of corrosion by H_2S and elementary sulfur was studied quantitatively. 13 ref.

6C-74. Beiträge zur Kenntnis der Korrosionserscheinungen des Zinks im Leclanché-Element. (Corrosion Phenomena of Zinc in Leclanché Cells.) C. Drotschmann. *Metall*, v. 3, Mar. 1949, p. 84-87.

New information concerning the effects of electrolyte composition, and of changes in the electrolyte caused by discharge, on zinc corrosion in the cell.

6C-75. Corrosion of Powdered Copper. (In Russian.) A. I. Levin and A. V. Pomosov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, June 1949, p. 592-599.

Corrosion at different temperatures in atmospheres of NH_3. Moisture is shown to be a basic factor. Experimental method.

6C-76. Corrosion and Protection of Underground Power Cables. L. J. Gorman. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 172-180, 181-184; discussion, p. 180-181.

The component parts of the underground power-system plant, together with conditions under which they operate. Causes of corrosion. Methods of mitigating corrosion which have been found successful. Protecting armored submarine cables by proper design. 15 ref.

6C-77. Proper Bonding of Power Cable Sheath Guards Against Galvanic Corrosion. W. D. Sanderson. *Corrosion*, v. 5, Nov. 1949, p. 403.

Recommended procedure for lead sheaths.

6C-78. The Corrosion of Lead by Xylene Solutions of Lauric Acid and p-Quinone. C. F. Prutton and J. H. Day. *Journal of Physical & Colloid Chemistry*, v. 53, Oct. 1949, p. 1101-1117.

Mechanism and kinetics.

6C-79. Admiralty Condenser and Heat-Exchanger Tubing in Oil Refinery Service. Wilson Lynes. *Petroleum Engineer*, v. 21, Nov. 1949, p. C42-C44, C47.

Comparison of the performance of plain and inhibited Admiralty tubes (70% Cu, 29% Zn, 1% Sn). Failure of plain Admiralty is usually caused by dezincification. This is unusual for inhibited Admiralty. Intergranular corrosion and cracking are rare causes of failure, but transgranular cracking is an important cause in oil refineries.

6C-80. An Electron Diffraction Study of the Oxide Films Formed on Nickel-Chromium Alloys. J. W. Hickman and E. A. Gulbransen. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 519-533.

Previously abstracted from *Metals Technology*. See item 6c-21, 1948.

6C-81. An Electron Diffraction Study of Oxide Films Formed on Copper-Nickel Alloys at Elevated Temperatures. J. W. Hickman and E. A. Gulbransen. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 534-546.

Previously abstracted from *Metals Technology*. See item 6c-22, 1948.

6C-82. Über den Angriff von Zink durch heisses Leitungswasser. (The Corrosion of Zinc by Hot Tap Meter.) Gerhard Schikorr. *Zeitschrift für Metallkunde*, v. 40, Sept. 1949, p. 344-348.

Effects of four types of water at 70° C. and of different influencing factors on rate of corrosion of sheet zinc. Experimental procedures and results.

6C-83. Materials for Bromine Containers. George S. Haines. *Industrial and Engineering Chemistry*, v. 41, Dec. 1949, p. 2792-2797.

Nickel and monel were found to be satisfactory container materials for dry bromine. Teflon is resistant to attack by bromine and is suitable as a gasket material.

6C-84. Resistance Alloys (Ni-Cr Type). *Metal Progress,* v. 56, Dec. 1949, p. 866, 868. Translated and condensed from "The Effect of Additions on the Oxidation of Nickel and Chromium-Nickel Alloys", by Lore Horn, *Zeitschrift für Metallkunde,* v. 40, Feb. 1949, p. 73-76.

Previously abstracted from original. See item 6C-29, 1949.

6D—Light Metals

6D-1. Aluminum and Fruit Juices. P. E. Gilroy and F. A. Champion. *Journal of the Society of Chemical Industry,* v. 67, Nov. 1948, p. 407-410.

The interaction of fruit juices and aluminum was investigated. Pure Al and Al-Mn and Al-Mg alloys are suitable for the storage of certain fruit juices. They are also suitable for citrus juices if the SO_2 preservative is suitably controlled.

6D-2. Metal Thickness and Corrosion Effects; Inter-Relations With Aluminum and Its Alloys. F. A. Champion. *Metal Industry,* v. 74, Jan. 7, 1949, p. 7-9, 13.

Corrosion tests are usually made on relatively thin metal. Allowance must therefore be made for this in applying the results of such tests to the greater thicknesses used in service. Methods of allowing for differences in thickness.

6D-3. La protection de l'aluminium par des films de gélatine bichromatée. (Protection of Aluminum by Coatings of Bichromated Gelatin.) Jean Frasch. *Métaux & Corrosion,* v. 23, Nov. 1948, p. 261-265.

Preparation of solutions and their application. The gelatin contains Zn or Mn bichromate. Corrosion resistance of the coated pieces under severe conditions of various types.

6D-4. Rate of the Primary Step of Aluminum Oxidation at Room Temperature at Low Pressures. (In Russian.) N. K. Audrushchenko and P. D. Dankov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Sept. 21, 1948, p. 353-356.

Data from comparative investigation of the primary oxidation step for a series of metals indicate a certain basic regularity, according to which the formation, on the surface of the metal, of a one or two-molecule oxide layer results in basic changes in the properties and behavior of such a layer. 10 ref.

6D-5. The Effect of Nickel on the Corrosion Resistance of High Purity Magnesium-Base Alloys. J. K. Davies. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 46-52.

Experimental results on corrosion of specimens of three British Mg alloys (two containing Al) to which up to 0.02% Ni had been added. The samples were immersed for two weeks in a 3% NaCl solution saturated with $Mg(OH)_2$.

6D-6. Corrosion Tests of a Heated Wing Utilizing an Exhaust-Gas-Air Mixture for Ice Prevention. George H. Holdaway. *National Advisory Committee for Aeronautics,* Technical Note No. 1791, Jan. 1949, 39 pages.

An investigation of the extent of corrosive attack in an aluminum alloy wing.

6D-7. The Behavior of Oxide Films on Aluminum. Fred Keller and Junius D. Edwards. "Pittsburgh International Conference on Surface Reactions", 1948, p. 202-212.

Information from the literature. Structure and mechanism of protective action. 30 ref.

6D-8. The Rate of Solution of Highest Purity Aluminum in Sodium Hydroxide Solutions. M. E. Straumanis and N. Brakss. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 98-106.

Reaction of aluminum (99.998%) with sodium hydroxide over the entire range of concentration up to 5N. Results help to resolve contradictions in previous publications on the dissolution of aluminum in bases.

6D-9. Protective Films: Natural Formation on Aluminium and Its Alloys. F. A. Champion. *Corrosion,* v. 5, Mar. 1949, p. 92-97.

Previously abstracted from *Metal Industry.* See item 6d-18, 1948.

6D-10. Treatment of Aluminum for Corrosion Prevention. Arthur A. Vernon. *Journal of Chemical Education,* v. 26, Mar. 1949, p. 147-148.

Methods of treatment and theories of the formation of corrosion-inhibiting surfaces.

6D-11. Thickness of Oxide Films Formed on Aluminum in Electrolytes of the 1st Group. (In Russian.) B. V. Deryagin and R. M. Fridlyand. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Nov. 1948, p. 1443-1448.

Determination under different voltages of oxidation, by an optical method. Results of experiment show that, at least in the range 5-170 volts, the oxidation proceeds at a constant potential gradient on the layer equal to 8.5×10^6 volts per cm.

6D-12. Some Factors Influencing the Corrosion Resistance of Aluminum. E. G. West. *Metallurgia,* v. 39, Feb. 1949, p. 210-214.

Recent trends toward a better understanding and some new means of protection. 20 ref.

6D-13. Beobachtungen uber den Einfluss der Walz- und Gluhbedingungen auf die Spannungskorrosions-beständigkeit von Blechen aus Aluminium-Zink-Magnesium-Legierungen. (Observations on the Effect of Rolling and Annealing Conditions on the Stress-Corrosion Resistance of Sheets of Aluminum-Zinc-Magnesium Alloys.) Walter Bungardt. *Metalloberfläche,* v. 2, July 1948, p. 137-140.

Above was studied for a series of Al-base alloys. The 1-mm. sheets studied included a group with and a group without vanadium.

6D-14. Dissolution of Aluminum in Sodium Hydroxide Solutions; Effect of Gelatin and Potassium Permanganate. Michael A. Streicher. *Industrial and Engineering Chemistry,* v. 41, Apr. 1949, p. 818-819.

Dissolution of commercially pure Al (99.2%) in 0.30 N NaOH at 23° C. was modified by addition of the above substances. 0.50% gelatin reduced weight loss by 50%. When potassium permanganate was added in quantities below 0.06%, there was an increase in weight loss. 0.10% was necessary to decrease weight loss. A mechanism is suggested for the action of these inhibitors. 10 ref.

6D-15. Magnesium Alloy Protection by Selenious Acid-Dichromate Solutions. L. Whitby. *Metallurgia,* v. 39, Mar. 1949, p. 233-240.

The standard selenious acid treatment has the disadvantages that fatigue strength is reduced and that on certain alloys adhesion is poor. Results of an investigation of the influence of sodium dichromate additions to the selenious acid bath.

6D-16. Surface Treatment and Finishing of Light Metals. Part II. Corrosion and Protection of Aluminium and Its Alloys. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 26, Apr. 1949, p. 805-810, 823.

Literature on corrosion, including effects of alloy constituents, impurities, dissimilar-metal inserts, cladding, and variations in heat treatment procedures. Intergranular and stress corrosion. (To be continued.)

6D-17. Der Einfluss des pH-Wertes und der Art der angreifenden Lösung auf die interkristalline und Spannungs-Korrosion bei Al-Mg-Legierungen. (Effect of pH-Value and Nature of Attacking Solution on Intercrystalline and Stress Corrosion of Al-Mg Alloys.) H. Vosskuhler. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 28-33.

Experimentally investigated with sea-water and similar solutions. Corrosion is inversely proportional to pH-value below 7; alkaline solutions have no corrosive effect on these alloys.

6D-18. The Use of Inhibitors for Controlling Metal Corrosion. Part V. Inhibitors for Light Metals. G. T. Colegate. *Metallurgia,* v. 39, Apr. 1949, p. 316-318.

13 references.

6D-19. Resistance of Magnesium Alloys to Corrosion. *Magazine of Magnesium,* May 1949, p. 13.

Qualitative ratings for the various alloys with respect to indoor and outdoor atmospheres and sea water.

6D-20. Uber den Einfluss verschiedener Legierungszusätze auf die Spannungskorrosionbeständikeit von Aluminium - Zink - Magnesium - Le - gierungen mit 4, 5% Zn und 3, 5% Mg. (The Effect of Different Alloying Additions on the Resistance of Aluminum-Zinc-Magnesium Alloys With 4.5% Zn and 3.5% Mg to Stress Corrosion.) Walter Bungardt. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 247-253.

Effect of Cu, Mn, V, Fe, and Si. Alloy compositions and test conditions. 18 ref.

6D-21. Service Tests Solve Aluminum Cylinder Head Corrosion Problems. M. W. Daugherty and R. F. Koenig. *Society of Automotive Engineers,* Preprint No. 339, 1949, 16 pages.

Cause of and method of preventing corrosion.

6D-22. Processes of Drop Corrosion of Aluminum. I. Corrosion of Aluminum in Contact With Droplets of Solutions of Salt Without Additions of Free Acid. (In Russian.) I. V. Krotov and T. M. Khachadurova. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Jan.-Feb. 1949, p. 18-26.

Investigated using Cu and Ag salts. The characteristic role of the oxygen in the air in relation to these processes. Experimental results from the thermodynamic point of view.

6D-23. Surface Treatment and Finishing of Light Metals. Part 2. Corrosion and Protection of Aluminium and Its Alloys. S. Wernick and R.

Pinner. *Sheet Metal Industries*, v. 26, June 1949, p. 1289-1296.

Corrosion-test procedures and various methods for prevention of corrosion. Comparative test data for various protective films. 153 ref.

6D-24. Corrosion Characteristics of Light Metals Used in Sprinkler Irrigation Systems. *Light Metal Age*, v. 7, June 1949, p. 14-15, 23.

Results of an investigation at the State College of Washington.

6D-25. Über das Spannungskorrosionsverhalten von Hy 43- und Igedur-Pressstreifen mit verschiedenen Zusäzen. (Concerning the Stress-Corrosion Behavior of Pressed Strips of Hy 43 and Igedur with Different Additions.) Gustav Siebel. *Zeitschrift fur Metallkunde*, v. 40, May 1949, p. 162-166.

The effects of Cu, Mn, Cr, V, and Ti, and of an annealing treatment, on the strength properties and stress-corrosion resistance of an Al-Zn-Mg alloy and the effect of Mn, Cr, and Ti on the same properties of an Al-Cu-Mg alloy.

6D-26. The Rate of Solution of High Purity Aluminum in Various Bases. M. E. Straumanis. *Journal of the Electrochemical Society*, v. 96, July 1949, p. 21-26.

Series of dissolution experiments of high purity Al (99.998% in KOH, $Ba(OH)_2$, $Sr(OH)_2$, $Ca(OH)_2$, $Mg(OH)_2$, and NH_4OH solutions of different concentrations. 25 ref.

6D-27. Über den Einfluss der natürlichen Witterung auf die Spannungskorrosion von Aluminiumlegierungen. (The Effect of Natural Weathering on the Stress-Corrosion of Aluminum Alloys.) Gerhard Schikorr and Günter Wassermann. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 201-205.

Experiments on Al alloys in industrial, city, maritime, and rural atmospheres. Results are compared with those obtained on immersion in a 3% common salt solution.

6D-28. The Dissolution of Aluminum in Sodium Hydroxide Solutions. II. Michael A. Streicher. *Journal of the Electrochemical Society*, v. 96, Sept. 1949, p. 170-194.

Effect of impurities, of NaOH concentration, of temperature and agitation on alloy, and of external current. Electrode potential measurements. 31 ref.

6D-29. Aluminium and the Transport of Refuse and Sewage. *Light Metals*, v. 12, Sept. 1949, p. 470-474.

An investigation of corrosion problems in the use of certain light alloys in the construction of special vehicles.

6D-30. Current Output of Light Metal Galvanic Anodes as a Function of Soil Resistivity. E. D. Verink, K. K. Reid, and E. R. Diggins. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 101-103.

Data obtained from Alcoa test installations.

6D-31. Fundamental Characteristics of Magnesium Galvanic Anodes. H. A. Robinson. *National Association of Corrosion Engineers*, "Cathodic Protection; A Symposium", 1949, p. 104-113.

Properties of Mg and its characteristics as an anode. Various factors affecting anode performance.

6D-32. Corrosion-Inhibited Fuels. Josef M. Michel and Karl F. Hager. *Industrial and Engineering Chemistry*, v. 41, Nov. 1949, p. 2616-2626.

Known methods and recent advances in the field of corrosion prevention in pipelines, storage containers, tanks, and other equipment in contact with fuels. Research on inhibitors, particularly with regard to prevention of ethyl-fuel corrosion of light-metal (Mg) tanks in airplanes. It was found that, without regard to construction materials used, even a small addition of Mepasin-sulfamide-acetic acid-sodium salt prevents any corrosion 54 ref

6D-33. Aluminium als Baustoff in Kältemaschinen mit Chlormethyl als Kältenmittel. (Aluminum as Structural Material in Refrigerators With Methyl Chloride as Refrigerant.) Kurt Zimmer *Chemische Technik*, v. 1, Aug. 1949, p. 69.

Tests made to determine the suitability of a cast Al compressor. Chemically impure Al is believed to be the reason for the high corrosiveness of methyl chloride on Al. Experiments with dry SO_2 produced no corrosion.

6D-34. The Effect of Minor Alloying Elements on the Rate of Dissolution of Aluminum in Bases. M. E. Straumanis. *Journal of the Electrochemical Society*, v. 96, Nov. 1949, p. 310-317.

Dissolution rate of aluminum in 0.5*N* NaOH, $Ba(OH)_2$, and NH_4OH is increased by addition of several minor alloying elements, especially by those of low hydrogen overvoltage, e.g., Pt, Fe, and Cu. Rate of solution of aluminum is shown to be proportional to log of concentration in % by weight of alloying element up to 5%. The effect of alloying elements with high hydrogen overvoltage is entirely different. Zn, Cd, and Pb slightly increase the rate of dissolution of aluminum. Bi does not influence the rate, and Sn and Sb retard it. 12 ref.

6D-35. Influence de la contamination superficielle sur la corrosion des toles en alliage de Magnésium et de Manganèse. (Effect of Surface Contamination on the Corrosion of Magnesium-Manganese Alloy Sheets.) L. Rakowski. *Métaux & Corrosion,* v. 24, Sept. 1949, p. 193-210.

Experimental investigation indicates that difficulties encountered during chromizing of DTD 118 alloy sheets are caused by surface contamination and heterogeneity of the alloy surface. Methods of avoiding such difficulties. Effects of different corrosive media on specimens prepared in different ways.

6D-36. Problèmes de Corrosion que pose l'emploi des alliages de Magnésium en construction aéronautique. (Corrosion Problems Arising From the Use of Magnesium Alloys in Airplane Construction.) L. F. Le Brocq and H. G. Cole. *Métaux & Corrosion,* v. 24, Sept. 1949, p. 211-215.

Magnesium alloys widely used in airplane construction are generally protected by surface treatment (chromizing) or by corrosion resistant paints. However, certain cases where considerable corrosion may take place were investigated and remedies proposed.

6D-37. Étude des couches d'Alumine déposées sur l'Aluminium par oxydation anodique. (Study of Layers of Alumina Deposited on Aluminum by Anodic Oxidation.) J. J. Trillat and R. Tertian. *Revue de l'Aluminium,* v. 26, Oct. 1949, p. 315-319.

Four samples of high-purity (99.99%) Al were anodized in a sulfuric acid bath. Two of the samples were sealed to prevent further oxidation and two were not. The character of the oxide films was studied by X-ray and electron diffraction. No difference between sealed and unsealed films was detected. Progressive pickling of thick films seems to indicate that the superficial texture of the oxide does not extend to the deeper layers which are amorphous in character.

6D-38. Untersuchungen über Korrosionsangriffe in Kohlendioxyd-Drukgefässen aus Aluminiumlegierungen. (Research on Corrosive Attack on Aluminum Alloys in Carbon Dioxide Containers.) P. Schläpfer, H. Gäumann, and A. Bukowiecki. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Oct. 1949, p. 316-324.

Neither liquid nor gaseous CO_2, even when saturated with water, reacts with the inside walls. Corrosion in practice is explained by the action of $Al(OH)_3$ dissolved in the water present in the vessel as a separate phase. 20 ref.

6D-39. Prevention of Stress-Corrosion Cracking in Service. Edgar H. Dix, Jr. *Metal Progress,* v. 56, Dec. 1949, p. 803-806.

Theory of the stress-corrosion, and engineering considerations in its prevention. A portion of the 24th A.S.M. Edward deMille Campbell Memorial Lecture.

SECTION VII

CLEANING and FINISHING

7A—General

7A-1. Abrasive Blasting as a Surface Preparation. J. F. Farrell. *Organic Finishing,* v. 9, Dec. 1948, p. 18-21, 23.
Choice of equipment, applications, and advantages.

7A-2. Chemical Cleaning of Heat-Exchanger Equipment. C. M. Loucks and C. H. Groom. *Oil and Gas Journal,* v. 47, Dec. 23, 1948, p. 66-67.
Methods for removal of deposits of various types. Table shows resistance of the various metals to attack by the different cleaning agents.

7A-3. How to Corrosion-Proof Metal Parts. Robert G. Clendenin. *Steel,* v. 123, Dec. 20, 1948, p. 85-87, 116, 118.
Various cleaning procedures including removal of such films as mineral and saponifiable oil, insoluble particles, smut, hard water and unrinsed cleaner salts, and oxides. Grease, solvent, oil, and plastic-type corrosion preventives.

7A-4. The Flame-Spraying of Metals and Plastics. V. E. Yarsley, W. D. Jones, and F. A. Rivett. *Plastic Institute Transactions,* Oct. 1948, p. 13-23.
Construction and use of the Schori spraying pistol and its application in metal spraying and plastic spraying.

7A-5. Process Sheet for Sodium Hydride Descaling. George Black. *American Machinist,* v. 92, Dec. 30, 1948, p. 127.
Process applicable to alloys of Cr, Cu, Ni, W, and Co, as well as plain carbon steels.

7A-6. Electro-Spray Finishing of Tackle Boxes. C. M. Long. *Products Finishing,* v. 13, Dec. 1948, p. 32-34.
Both wrinkle finishes and glossy enamels are applied.

7A-7. Finishing Clinic. *Products Finishing,* v. 13, Dec. 1948, p. 60, 62, 64, 66, 68, 74, 76, 78, 80, 82, 84, 86.
Recent engineering developments in piping and heating plating baths; methods and equipment for baking organic coatings; some effects of surface-active agents in metal cleaning; proper spray-gun technique for economical finishing.

7A-8. Finishing Fine Costume Jewelry. Michael Spirito. *Industrial Finishing.* v. 25, Dec. 1948, p. 75-76, 79-80, 82.
Step-by-step methods used in applying decorative and protective coatings.

7A-9. Metallspritzpistolen. (Metal Spray Guns). H. Reininger. *Metalloberfläche,* v. 2, Jan. 1948, p. 1-13.
A survey of the most important types, their development and features of construction. 39 ref.

7A-10. Ceramic Coated Metals for Aircraft Power Plant Applications. R. A. Jones. *Steel Processing,* v. 34, Dec. 1948, p. 649-651.
Reviews work of Air Materiel Command.

7A-11. Solvent Degreasing—A Production "Tool." A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 21-23.
The three basic parts of degreasers for metallic or other nonporous materials; applications and advantages.

7A-12. Metallising in Relation to Foundry Practice. J. Barrington Stiles. *Foundry Trade Journal,* v. 85, Dec. 2, 1948, p. 525-530; Dec. 9, 1948, p. 551-552; discussion, p. 552-554.
Equipment, methods, and applications.

7A-13. Metal Finishing. Adolph Bregman. *Iron Age,* v. 163, Jan. 6, 1949, p. 274-281.
Noteworthy advances in basic metal finishing knowledge, the improvement of instruments for studying electroplate quality, the development of improved nonmetallic finishes, commercial position of the industry, and general technological progress during 1948.

7A-14. Protective Coatings. Joseph Mazia. *Machine Design,* v. 21, Jan. 1949, p. 110-114.
Characteristics and applications of

chemical-conversion finishes of various types for application to metals.

7A-15. Degreasers. Frank V. Faulhaber. *Products Finishing,* v. 13, Jan. 1949, p. 26, 28, 30, 32, 34, 36.

Types of degreasers; design, selection, installation, and operation of the units.

7A-16. Technical Progress in Metal Finishing During 1948. Walter A. Raymond. *Metal Finishing,* v. 47, Jan. 1949, p. 44-53, 99-101.

134 references.

7A-17 (Book). **Electrolytic Polishing and Etching of Metals.** (In Russian.) V. I. Layner. 243 pages. 1947. MASHGIZ (State-Scientific Publishing Co. for Machine-Construction Literature), Moscow, U.S.S.R. 21 roubles.

Main sections are concerned with electrolytic pickling; electropolishing in production of electroplated coatings; and electropolishing of metallographic specimens. The book is a heterogeneous mixture of literature review including patents; and descriptions of original work. While the section on pickling is largely based on the literature, most of the section on electropolishing deals with original research. (From review in *Electroplating and Metal Finishing.*)

7A-18. Methods and Types of Cleaners for Various Metals. *Materials & Methods,* v. 29, Jan. 1949, p. 89, 91.

A tabular presentation.

7A-19. The Surface Appearance of Polished Metals—Physical and Psychological Considerations. G. E. Gardam and J. F. Mills. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 17-26. (Reprint.)

The characteristic appearance of metal articles is shown to be connected with form and specular reflectivity of the surface. Psychologically, the attention-compelling property of such surfaces is due to confusion felt in viewing simultaneously the surface itself and the virtual images behind it. The quality of a polished metal surface is chiefly connected with the clarity of the images seen therein. The three main divisions of metal polishing operations: surface trueing, surface flowing, and haze removal.

7A-20. Barrel Finishing of Metal Products. Part 27. The Creation of a Barrel Finishing Laboratory. H. Leroy Beaver. *Products Finishing,* v. 13, Feb. 1949, p. 52, 54, 58, 60, 62, 64.

Proposes that such a laboratory be created under sponsorship of one or several technical societies. Points out benefits to be derived.

7A-21. Finishing Developments of 1948 in Review. Allen G. Gray. *Products Finishing,* v. 13, Feb. 1949, p. 66, 68, 74, 76, 78, 80, 82, 84, 86, 88, 90, 92, 94.

7A-22. Enameling Auto Window Moldings by Electrostatic Spray. T. S. Blair. *Iron Age,* v. 163, Feb. 10, 1949, p. 75-77.

Savings of 50-60% in enameling and lacquering auto-window garnish moldings achieved by installation of an electrostatic spray unit.

7A-23. Organic Linings for Chemical Equipment. Kenneth Tator. *Corrosion,* v. 5, Feb. 1949, p. 55-58.

The corrosion-preventive properties of the above; specific information concerning various types. Deals only with plastics and rubbers.

7A-24. Industrial Applications of the Sodium Silicates; Some Recent Developments. Reynold C. Merrill. *Industrial and Engineering Chemistry,* v. 41, Feb. 1949, p. 337-345.

Recent developments in application as adhesives, soap builders, detergents, metal cleaners, cements, and binders for briquets and other bonded materials. 116 ref.

7A-25. Pickling vs. Grit Blasting for Cleaning. J. F. Farrell. *Metal Finishing,* v. 47, Feb. 1949, p. 69-75.

Advantages and limitations of abrasive cleaning as compared to pickling. Equipment for the former, economic considerations, effect on finish, abrasives used, and typical applications.

7A-26. Nonmetallic Coatings. John Delmonte. *Machine Design,* v. 21, Feb. 1949, p. 97-102, 162.

Engineering characteristics of various types of protective coatings, including organic and porcelain-like finishes.

7A-27. Some Properties and Applications of a New Coating Lacquer. G. H. Ott. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 367-370, 381.

New synthetic resin called Araldite, sold by Ciba of Switzerland. Mechanical and chemical properties of Araldite coatings on test specimens and on food containers and collapsible tubes.

7A-28. The Reduction of Polishing Costs. S. Wernick. *Journal of the Electrodepositors' Technical Society,* v. 23, 1949, p. 215-235; discussion, p. 235-239. (Preprint.)

Effects of the economics of polishing on British industry. Mechanical and manual methods.

7A-29. Preparation of Metal Surfaces Preparatory to Finishing. V. M. Darsey. *Paint and Varnish Production Manager,* v. 29, Mar. 1949, p. 78-82.

Various methods, including phosphate coating of steel. Tests for surface cleanness; preparation of Zn, Al, and their alloys.

7A-30. Polishing: Procedure—Abrasives—Preparation and Application of Glue. G. F. Weil. *Metal Industry,* v. 74, Feb. 11, 1949, p. 111-112.

Polishing procedure from initial cutting-down to final finishing. Abrasives, glues, felt bobs, cold cements, and mops as polishing materials. (To be concluded.)

7A-31. The Use of Graphite in Metal Finishing Operations. J. R. Murphy. *Metal Finishing,* v. 47, Mar. 1949, p. 51-55.

Uses include high-temperature conveyer lubrication; degreasers and parts-washer lubrication; automatic plating apparatus lubrication; static elimination; electroplating nonconductors; and as stop-off for hot-dip tinning.

7A-32. Reducing Finishing Costs Through Modern Techniques. S. Wernick. *Metal Finishing,* v. 47, Mar. 1949, p. 63-70, 73.

Improved methods for mechanical, chemical, and electrochemical polishing methods, especially electropolishing of nickel. Appendix deals with bright nickel plating.

7A-33. Flame Spraying of Metals and Plastics. F. A. Rivett. *Engineering,* v. 167, Feb. 11, 1949, p. 143-144.

Recent developments.

7A-34. Silicon Monoxide Protected Front-Surface Mirrors. Georg Hass and Noel W. Scott. *Journal of the Optical Society of America,* v. 39, Feb. 1949, p. 179-184.

Evaporation method for producing mirrors with good abrasion, corrosion, and reflection qualities. Aluminum is used because evaporated Al films have high reflectivity in all useful spectral ranges and a finer grain and smoother surface than similar silver coatings. Silicon monoxide was found to produce good-quality protective films.

7A-35. New Developments Widen Metallizing Uses. John E. Wakefield. *Iron Age,* v. 163, Mar. 17, 1949, p. 81-85.

Several recent developments in materials and techniques, plus a better understanding of the structure and properties of sprayed metals, which have expanded the field of metallizing applications. Lubricating properties of sprayed coatings.

7A-36. Finishing Review for 1948. Edward Engel. *Tool Engineer,* v. 22, Mar. 1949, p. 31-32.

Cleaning, plating, aluminum anodizing, surface-finish testing devices, preparation of metals for painting, and painting.

7A-37. Applying Industrial Finishes. G. J. Cavanaugh. *Steel,* v. 124, Mar. 21, 1949, p. 106-108.

Choice of organic material to be used on metal products depends on many factors. Size, shape, and service use discussed in relation to consumption of materials and methods of application.

7A-38. Combatting Corrosion With Rubber Lining. R. McFarland. *Corrosion,* v. 5, Mar. 1949, p. 98-99.

Advantages and limitations of the various types of rubber.

7A-39. Polishing: Dressing Bobs—Mops—Buffing—Automatic Devices. (Concluded.) G. F. Weill. *Metal Industry,* v. 74, Feb. 25, 1949, p. 146-147.

Adhesives, the buffing process, heat development, and automatic devices.

7A-40. (Book.) **Journées des Etats de Surface.** (Proceedings of Conference on Surface States.) 273 pages. 1946. Editions de l'Office Professionnel Général de la Transformation des Métaux, 16, Avenue Hoche, Paris 8, France.

Summary report plus 38 papers presented at conference in Paris, Oct. 1945, and accompanying discussion. The papers are classified under general headings: physicochemical aspects; surface structure; surface state vs. properties; and corrosion. Most of the individual papers are abstracted separately.

7A-41. Finishing Royal Typewriters in Wrinkle Enamel. L. E. Marsden. *Industrial Finishing,* v. 25, Mar. 1949, p. 26-28, 31-32.

Surface preparation, masking, glazing, spraying, and baking for wrinkle finish.

7A-42. Coating and Finishing With Automatic Spraying Equipment. Part II. Frank V. Faulhaber. *Organic Finishing,* v. 10, Mar. 1949, p. 9-12.

Equipment and procedures.

7A-43. Blast Cleaning Equipment Design. J. F. Farrell. *Organic Finishing,* v. 10, Mar. 1949, p. 15-16, 18-19.

Describes, illustrates, and diagrams the various types.

7A-44. Moisture-Resistant Coatings for Metal. William F. Singleton and William C. Johnson. *Industrial and Engineering Chemistry,* v. 41, Apr. 1949, p. 749-753.

Data for a range of polymeric coatings with respect to permeability, adhesion to certain metals,

and moisture resistance under alkaline conditions. Selected coatings were pigmented to determine the effect of type and concentration of pigment.

7A-45. Sodium Silicates in Metal Cleaning. Clinton W. MacMullen and Clarence G. Ozar. *Metal Finishing,* v. 47, Apr. 1949, p. 52-54.

Properties and applications; advantages.

7A-46. Synthetic Surface-Active Agents in Metal Finishing. Georgia Leffingwell. *Metal Finishing,* v. 47, Apr. 1949, p. 68-70.

Recent developments in uses for electroplating, wire-pickling baths, corrosion prevention and rust inhibitors, cutting and grinding oils, and metal cleaners.

7A-47. Eigenschaften gespritzter Metalluberzuge. (Properties of Sprayed Metal Coatings.) I. H. Reininger. *Metalloberfläche,* v. 2, Sept. 1948, p. 185-192.

Specific weights, densities, porosities, and electrical conductivities of sprayed metal coatings on different metals. Structures of different types of coatings. 25 ref.

7A-48. Die pyrolytische Plattierung von Kupfer, Eisen und Stahllegierungen mit Molybdän, Wolfram und Chrom. (Pyrolytic Plating of Copper, Iron, and Steel Alloys With Molybdenum, Tungsten, and Chromium.) Edmund R. Thews. *Metalloberfläche,* v. 2, Sept. 1948, p. 193-196.

The above is based on the carbonyl process of depositing metals. Plating method; advantages and disadvantages, generator and plating plant, mechanical defects, and adhesiveness of the platings.

7A-49. The Lustron Home. Part II. Ezra A. Blount. *Products Finishing,* v. 13, Apr. 1949, p. 22-34, 36.

Enameling processes involved in making the factory-built housing unit.

7A-50. Barrel Finishing of Metal Products. Part 28. Barrel Finishing in England; The Edmonds Burnishing Barrel. H. Leroy Beaver. *Products Finishing,* v. 13, Apr. 1949, p. 50, 52, 56, 58, 62, 66, 68.

7A-51. Chemical Surface Treatments for Metals. A. E. Durkin. *Tool Engineer,* v. 22, Apr. 1949, p. 22-25.

Alkaline cleaning, vapor degreasing, rust and scale removers, black oxide treatments of steel, and phosphate coatings. This installment deals only with general principles and equipment and application to steels. (To be concluded.)

7A-52. Preparing Surfaces for Metallizing by Blast Cleaning. Rick Mansell. *Machinery,* v. 55, Apr. 1949, p. 165-168.

Selection of blasting abrasive, air volume and pressure required, and removing surface oil and grease from part to be metallized. Suggestions on blasting technique.

7A-53. Ceramic Coated Metals for Aircraft Power Plant Applications. R. A. Jones. *Better Enameling,* v. 20, Apr. 1949, p. 26-27, 29.

Development work of Army's Air Materiel Command.

7A-54. Liquid Blasting Cleans and Finishes Metallic and Nonmetallic Surfaces. B. H. Marks. *Materials & Methods,* v. 29, Apr. 1949, p. 64-67.

Surface blasting with a high-velocity stream of abrasive particles suspended in liquid provides an economical means of deburring, descaling, and preparing surfaces for finishes. Equipment and procedures.

7A-55. Finishing Electric Clocks. Joseph St. Pierre. *Industrial Finishing,* v. 25, Apr. 1949, p. 30-32, 34.

Procedures applied to steel and diecast Al.

7A-56. Spark Guard for Electrostatics. S. M. Milanowski. *Electronics,* v. 22, May 1949, p. 138, 140, 142, 144.

Electronic safety device which has enabled manufacturers of electrostatic paint-spray equipment to comply with standards of the NBFU in producing high-voltage units that will not create a fire or safety hazard when utilized in a vapor-laden atmosphere.

7A-57. Barium Potassium Chromate Pigment in Metal Protective Paints. A. J. Eickhoff and L. M. Kebrich. *Paint, Oil and Chemical Review,* v. 112, Apr. 28, 1949, p. 18, 20, 39-42A.

Development, properties, and advantages. This pigment, now commercially available, is an efficient corrosion inhibitor of low tinting strength, which can be formulated into air-dry or baking-type coatings for metals. Recommended formulations. Test-panel photographs.

7A-58. Building Organic Protective Coatings to Special Requirements. K. G. Compton. *Corrosion,* v. 5, May 1949, p. 148-150.

The various types of organic coatings for metals. Examples of coatings formulated to fulfill special requirements, by application of scientific principles as well as empirical tests. 15 ref.

7A-59. A Method of Centrifuging Alkali Cleaners in Finishing Plants. Philip P. Sharples. *Finish,* v. 6, May 1949, p. 23-24, 68, 70.

Use of supercentrifuge to remove miscellaneous contaminants from metal-cleaning baths. Procedure resulted in load increase of 20% and large reduction in cleaner consumption.

7A-60. Some Thoughts on Drying. Rollin H. Wampler. *Products Finishing,* v. 13, May 1949, p. 46-50, 54, 56.

Mechanism of drying by evaporation of solvents, by oxidation and polymerization, and by polymerization alone. Some drying troubles and their solution.

7A-61. Spotlighting Finishing Progress. Allen G. Gray. *Products Finishing,* v. 13, May 1949, p. 58, 60, 62, 64, 66, 68, 70, 72, 74, 76, 78, 80, 82, 84, 86, 88.

Trends in alkyd resins; effect of copper in nickel-plating solutions on corrosion resistance of the plate; an accelerated atmospheric corrosion test for organic coatings; proper heating in galvanizing operations; and improved method for treatment of waste pickle liquor.

7A-62. Finishing of Metal Parts Speeded-up by Electro-Coating. Art Sheldon. *Production Engineering & Management* v. 23, May 1949, p. 57-59.

Conveyerized installation for electrostatic spraying of metal parts.

7A-63. Designing With Metallized Structures. John E. Wakefield. *Product Engineering,* v. 20, May 1949, p. 117-121.

Use of metallization to give specialized properties in local areas. Such properties include improved lubricating qualities, good resistance to wear and corrosion, low cost and improved electrical properties. Recommended surface preparation.

7A-64. Dielectric Continuity Tester. R. H. Marsh and Theodore Packard. *Electrical Manufacturing,* v. 43, May 1949, p. 119-120, 122.

By continuous testing of wire as it leaves the enamelling furnace, the pulse-timing unit checks insulation quality in process.

7A-65. Metallizing Non-Metallics. John Delmonte. *Modern Plastics,* v. 26, May 1949, p. 87, 90, 140.

Five methods are: chemical deposition of metallic films; adhesive films, metallic and graphitic powders; vacuum evaporation of metals; cathode sputtering; and metal spraying. Applications.

7A-66. Recent Developments in Metal Spraying. John E. Wakefield. *Modern Machine Shop,* v. 21, May 1949, p. 98-102, 104, 106.

Development and use of self-bonded metal, showing how this innovation opens up much wider applications of metal spraying, by eliminating need for extensive machining operations. Other new developments, including new metals for spraying, a gas-flow meter, metallizing guns. Greater wear resistance and ability to absorb lubricants are cited as properties of sprayed coatings.

7A-67. How to Finish Machines. R. E. Gwyther and E. S. Stout. *American Machinist,* v. 93, May 5, 1949, p. 90-93.

Recommended surface-preparation and paint application procedures for protection of machinery.

7A-68. Sprayed Metal. H. S. Ingham. "Engineering Laminates" (John Wiley & Sons, 1949) p. 551-572.

The equipment, the process, and the characteristics (including structure and corrosion resistance) of the product. Effects of base metal on bond strength for "Sprasteel" coatings. Applications.

7A-69. Surface Preparation. Preparation of Metals for Organic Finishing. Walter R. Meyer. **Phosphate Treatments for Metals.** Walter A. Raymond. **Surface Preparation as a Measure of Preventing Corrosion.** E. Davenport. **The Principles of Solvent Vapor Degreasing.** G. W. Walter. *Organic Finishing,* v. 10, Apr. 1949, p. 10-15, 17, 19-33.

7A-70. A Note on the Possible Role of the Solid Surface in Electroless Plating. E. E. Glenn, Jr., E. L. Cook, and Norman Hackerman. *Journal of the Electrochemical Society,* v. 95, May 1949, p. 110C-112C.

Some experiences with electroless plating of Ni on both glass and metal surfaces. Effects of seeding and rough surfaces on initiation of deposition. Theoretical conclusions.

7A-71. Evaluation of Surface Finish of Porcelain Enamels by a Replica Method. J. C. Richmond and A. C. Francisco. *Journal of the American Ceramic Society,* v. 32, May 1, 1949, p. 170-179.

Technique for making ethyl cellulose replicas of enameled and other surfaces. Photographic prints of a number of replicas made without use of negatives, and methods of analyzing the replicas. Haze of replicas was used to evaluate 25 enamels abraded in the standard P.E.I. surface-abrasion test. Comparison of these ratings with those obtained by the standard method, visual estimates of abrasion as seen

on the specimens, and as seen in the replicas. 14 ref.

7A-72. Metal Spraying. Miles J. Rowan. *American Machinist,* v. 93, May 19, 1949, p. 107-118.

Nature of sprayed metal and the conditions under which it may be expected to give good service. Equipment, and steps required to produce good coatings.

7A-73. Description, Design and Production Costs of a Conveyorized Spray Finishing System. E. Paul Schwartz. *Proceedings, American Electroplaters' Society,* v. 25, 1949, p. 291-302; discussion, p. 302-304.

System designed for finishing of typewriter parts. The base metals are sheet steel, cast iron, and die-cast aluminum.

7A-74. Some Aspects of Deburring and Polishing in Barrels. Hans Weiss. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 349-353; discussion, p. 353-354.

7A-75. Die Sulfohalogenide in der Oberflächenveredlung. (Use of Sulfohalides for Cleaning of Surfaces.) A. Kufferath. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 69-70.

Chemistry of sulfohalides (general formula, RSO_2X) and their use as metal-cleaning agents.

7A-76. Surface Preparation for Metallizing. Rick Mansell. *Steel Processing,* v. 35, May 1949, p. 241-244, 267.

Various methods: machining; blasting; electrical bonding (conventional and Fusebond); and the Sprabond Process, in which a special metal is applied directly, even to polished surfaces, by spraying, forming a base for the desired metal.

7A-77. Application of the Radioactive Tracer Technique to Metal Cleaning. J. C. Harris, R. E. Kamp, and W. H. Yanko. *ASTM Bulletin,* May 1949, p. 49-52.

Details of new procedure. Carbon 14 was incorporated by chemical synthesis in N,N-di-n-butyl stearamide, and the latter dissolved in SAE 60 oil, which was applied as a coating to sample pans made of surface-hardened sheet steel and stainless steel. G.M. counts after each of a series of standardized detergent washes. The method is more sensitive than existing methods and is quantitative in character.

7A-78. Vapor Blasting Precision Parts. *Steel,* v. 124, June 13, 1949, p. 104.

Steel parts for diesel-fuel-injection pumps are deburred quickly and effectively, using air under 100 psi. pressure and a water-grit mixture, in a rubber-lined barrel.

7A-79. Coloring of Metals. N. Bruce Bagger. *Materials & Methods,* v. 29, June 1949, p. 67-82.

Introduction plus sections on iron and steel; Cu and its alloys; Cd and Zn; Al; Mg; and the final finishing operation. Typical methods.

7A-80. Maintenance by Metallizing. John E. Wakefield. *Welding Engineer,* v. 34, June 1949, p. 24-28.

Metallizing gun units which spray over 30 different kinds of metal and can apply various coating to almost any kind of base material. Methods of preparing the base material and coating procedures for various parts.

7A-81. The Mechanisms of Some Elementary Surface Reactions. Keith J. Laidler. *Journal of Physical & Colloid Chemistry,* v. 53, May 1949, p. 712-732.

Basic rate and equilibrium equations for adsorption and desorption processes are developed in a somewhat different manner from previously. The treatment is then extended to the production and recombination of atoms and free radicals at surfaces, important in connection with free-radical and overvoltage mechanisms. Also, adsorption with surface penetration. 26 ref.

7A-82. The Motor-Car v. the Weather. H. Silman. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 121-136; discussion, p. 136-138.

Various methods of protecting different motor car parts from corrosion, which include plated surfaces, phosphate coatings, and organic finishes.

7A-83. Report of Committee D-1 on Paint, Varnish, Lacquer, and Related Products. *American Society for Testing Materials,* Preprint 51, 1949, 41 pages.

Proposals for changes in specifications and test methods. Measurement of dry film thickness of above type of product; exterior exposure tests of paint on wood and steel; testing bituminous emulsions as metal coatings; and other material of particular interest to the paint industry.

7A-84. Interferenzschichten (einschliesslich Korrosionsschutzschichten) auf Metallspiegeln. (Interference Films (Including Corrosion-Preventive Films) on Metal Mirrors.) K. Steinbuch. *Zeitschrift fur Angewandte Physik,* v. 1, Jan. 20, 1949, p. 256-260.

A theoretical, mathematical discussion showing that the reflecting

power of metal mirrors can be greatly increased by interference films. Conditions for any given film thickness and wave length, and how the final formula can be derived by two different methods. Dimensions of anti-corrosion films that will increase rather than reduce the reflecting power.

7A-85. Herstellung dunner Metall und Salzschichten durch Aufdampfen in Vakuum. (Production of Thin Films of Metals and Salts by Vacuum Vapor Deposition.) Karl Rohn. *Zeitschrift fur Physik,* v. 126, Apr. 4, 1949, p. 20-26.

For a thin film of LiF, the close agreement of a vapor-deposited layer of salt with the layer of salt we would expect from the straight-line path of the molecules between the small vaporizing furnace and the target.

7A-86. Cellulose Acetate Plastics. XXI. Printing and Decorative Finishing. Vivian Stannett. *Plastics* (London), v. 13, May 1949, p. 261-265.

Conventional printing; silk-screen printing; stamping; etching; embossing; metal plating; vacuum deposition; and metal inlays. 28 ref. (To be continued.)

7A-87. Evaluation of Porcelain-Enamel Texture by a Plastic-Replica Technique. *Better Enameling,* v. 20, June 1949, p. 8-11. Based on paper of same title by J. C. Richmond and A. C. Francisco, *Journal of the American Ceramic Society,* v. 32, May 1, 1949, p. 170-179.

Previously abstracted from original, item **7A-71, 1949.**

7A-88. Some Comments on the Cleaning of Sheet-Metal Pressings Prior to Enamelling. P. G. Patten. *Sheet Metal Industries,* v. 26, June 1949, p. 1297-1301.

Recommended procedures, both mechanical and chemical, and solutions for the latter.

7A-89. Vapor-Phase Deposition of Refractory Metals. *Iron Age,* v. 163, June 16, 1949, p. 98-100. Condensed from "The Vapor-Phase Deposition of Refractory Materials," by I. E. Campbell, C. F. Powell, D. H. Nowicki, and B. W. Gonser.

Present state of development and commercial applications. Vapor-deposited refractory coatings and their properties. The metals themselves; and their carbides, nitrides, borides, silicides, and oxides.

7A-90. Acid Pretreatment of Porcelain Enamel. *Iron Age,* v. 163, June 16, 1949, p. 100.

Effects on acid and abrasion resistance as discussed in a recent report of National Bureau of Standards.

7A-91. Polishing: Recommended Procedures for Ferrous and Non-Ferrous Metals. Recommended Methods for Aluminium, Silver and Electroplates. G. F. Weill. *Metal Industry,* v. 74, May 20, 1949, p. 407-409; June 3, 1949, p. 442-444.

Mechanical methods and selection of abrasives. Detailed recommendations for each of the common types. Special procedures necessary for Al and its alloys.

7A-92. Metal Spray Coatings for Metals and Plastics. David Brownlie. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 27-28.

Equipment, procedures, and applications.

7A-93. Production Painting of Metal Signs. Kenton S. Donaldson. *Industrial Finishing,* v. 25, June 1949, p. 24-25, 27-28, 30.

Use of screen process.

7A-94. Reproducing Wood Grain Rapidly. W. Nelson White. *Industrial Finishing,* v. 25, June 1949, p. 50-52, 54.

How reproduction of natural wood grain on plain surfaces, by use of an etched copper plate and inking roller, is speeded by use of an automatic power machine.

7A-95. Finishing Metal Caskets. Joseph Blaser. *Industrial Finishing,* v. 25, June 1949, p. 55-56.

Cleaning and finishing methods used at one plant.

7A-96. 4-Color Silk Screen Process Reproduction. Michael Elukevich. *Industrial Finishing,* v. 25, June 1949, p. 60, 62, 64.

Screen-printing stencils are made from enlarged photographs of a 4-color painting and are used to make perfect four-color reproductions on advertising signs.

7A-97. Coating Small Hardware With Lacquer. Fred Rossberg. *Industrial Finishing,* v. 25, June 1949, p. 66-67, 71.

How brass, bronze, steel, and iron hardware parts are cleaned and coated with lacquer in modern dip-whirl coating machines.

7A-98. Coating Record-Player Turntables With Flock. H. F. Thiele, Jr., and E. G. Koriath. *Industrial Finishing,* v. 25, June 1949, p. 72, 74.

Procedures and equipment.

7A-99. Protecting Fixtures and Patterns in Open Storage. Howard N. Smith. *Iron Age,* v. 163, June 30, 1949, p. 55-57.

Use of strippable plastic coatings.

Methods of application and economics.

7A-100. Metal Surfaces. Their Preparation and Painting. (In English.) G. Diehlman, A. J. Eickhoff, and J. G. Wills. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 265-270.

Surface preparation and painting of iron, galvanized iron, and aluminum from both the mechanical and chemical viewpoints. Effect on performance of paint applied over pickled, intact mill scale, and corroded steel surfaces; laboratory test to indicate surface wetting ability of oil and varnish vehicles applied to rusted steel; practical test showing correlation between wetting ability of oil and varnish vehicles and paint performance on partially corroded steel; graphical analysis of paint-surface wetting characteristics vs. metal protection; and the role of chemical pretreatments in providing adequate adhesion of paint coatings on aluminum and galvanized steel surfaces. 13 ref.

7A-101. Adesivita' di Film di Vernici su Superfici di Vetro e di Metalli. (Adhesivity of Varnish Films to Glass and Metal Surfaces.) A. G. Nasini and V. Rava. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 309-313.

Improved method for determining the above. Comparative values of adhesivity of standoil-base and phenolic-resin-base varnishes at drying temperatures of 140 and 180° C., the latter giving approximately double the adhesivity of the former. Principal sources of error and limitations, and potentialities for use in study of the physical chemistry of surfaces.

7A-102. Industrial Finishes and Finishing. (In English.) F. G. Weed and N. P. Beckwith. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 625-635.

Finishing materials and their application as protective and decorative coatings on automobiles and other industrial products. Surface preparation requirements and procedures. Application procedures, particularly electrostatic deposition. Methods of baking organic finishes, with emphasis on infrared ovens.

7A-103. New Way of Preventing Corrosion. Trevor Williams. *Canadian Chemistry and Process Industries,* v. 33, June 1949, p. 536.

Rubber latex, containing sodium benzoate, when sprayed on metal surfaces is said to have excellent corrosion resistant properties.

7A-104. How to Select Superfinishing Abrasives. E. L. Hemingway. *American Machinist,* v. 93, July 14, 1949, p. 101-104.

The bearing of the size of grit, hardness of bond, pressure, work speed, lubricant, and material and abrasive hardness on quality of finish.

7A-105. Les dépots d'acier par projection et l'aciération de l'aluminium. (Deposits of Steel Produced by Projection; and Steel Coating of Aluminum.) Jacques Cauchetier. *Revue de l'Aluminium,* v. 26, May 1949, p. 171-172.

The physical and mechanical properties of steel deposits on Al, Mg, and their alloys, produced by projection (the powder pistol). The metallization process, surface preparation, machining, and abrasion characteristics of the deposit.

7A-106. Spotlighting Finishing Progress. Allen G. Gray. *Products Finishing,* v. 13, July 1949, p. 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 72, 74, 76.

Discusses finishes for steel products, porosity tests for electroplated coatings, recent developments in paint removers, chromate gelatine films on aluminum, and primers for light metals.

7A-107. Production Clinic for Finishing Die Castings. *Die Castings,* v. 7, July 1949, p. 38, 40-42.

Stress in electroplated coatings and improving alkyd organic-finishing materials.

7A-108. Principles of Writing Specifications for Metal Protective Paints. W. W. Cranmer. *Corrosion,* v. 5, July 1949, p. 234-236.

Reviews and criticizes previously published paint specifications. Shows how to provide a concise, definite, and complete statement of requirements. 10 ref.

7A-109. Evaluation of Porcelain Enamel Texture by a Plastic-Replica Technique. J. C. Richmond and A. C. Francisco. *Finish,* v. 6, July 1949, p. 25-27, 48.

Previously abstracted from *Journal of the American Ceramic Society.* See item 7A-71, 1949.

7A-110. Precision Tumbling. *Tool & Die Journal,* v. 15, July 1949, p. 66.

Procedure uses specially prepared abrasives, and can be applied to a wide variety of miscellaneous parts.

7A-111. Tank Linings and Insulating Materials. V. Evans. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 129-143. (Preprint.)

Principal materials used to deal with corrosive conditions such as those found in pickling and plating operations. Insulating methods for rack and jig coatings. Emphasis is placed on recent methods of lining, including use of plastics. 12 ref.

7A-112. (Book) **Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées.** (First International Congress of the Paint and Associated Industries.) 650 pages. 1948. André Tournon et Cie., 20 rue Delambre, Paris 6, France.

All but the first 54 pages are devoted to the 101 papers presented at the above conference, held in Paris, Oct. 1-6, 1947. A wide variety of fundamental and practical topics is discussed. Includes several papers directly connected with metal coating and surface preparation. These are abstracted separately.

7A-113. Metallrengöring. (Metal Cleaning). *Finish* (Sweden), v. 6, Feb. 1949, p. 33-36, 38, 46; Mar. 1949, p. 55-58, 60.

Cleaning of metals by electrolysis, alkalies, solvents, emulsions, and petroleum derivatives, by etching with acids and electrolytically, and by mechanical methods.

7A-114. Uber die Grösse und Verteilung der reagierenden Stellen, "Störstellen" bzw. "aktiven Stellen" an Metalloberflächen. (On the Size and Distribution of Reacting Patterns, Interference Patterns, or "Active" Patterns on Metal Surfaces.) Otto Erbacher. *Zeitschrift fur Elektrochemie und angewandte physikalische Chemie,* v. 53, Mar. 1949, p. 54-67.

Conclusions based on previously determined data on the electrochemical and adsorptive behavior of metal surfaces. Effects of solvents on sheet metals. 13 ref.

7A-115. Uber die Wirksamkeit der Oberflächenatome, "Störstellen" bzw. "aktiven Stellen" an Metalloberflächen. (On the Effect of Surface Atoms, Interference Patterns, and "Active" Patterns on Metal Surfaces.) Otto Erbacher. *Zeitschrift fur Elektrochemie und angewandte physikalische Chemie,* v. 53, Mar. 1949, p. 67-75.

Results of several series of experiments made to study the adsorption of metal ions, the process of solution, and electrochemical exchange at metal surfaces. Basic differences between adsorption on platinum and on other metals. 14 ref.

7A-116. Poren- u. Schichtdickenbestimmung leitender u. nichtleitender Schutzuberzuge. (Determining the Porosity and Thickness of Conducting and Nonconducting Protective Coatings.) A. Vollmer. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 145-147.

Several methods.

7A-117. Developments in High Temperature Ceramics on Metals. Richard P. Harner. *Steel Processing,* v. 35, June 1949, p. 294-295, 330.

Development of a product designated as L625-2056, which largely superseded the National Bureau of Standards A-19 coating developed in 1944. Superior heat-resistant properties of the product and miscellaneous aircraft and automotive applications.

7A-118. Untersuchungen uber die Absorptionseigenschaften von Farbanstrichen und den Erwärmungsvorgang bei Strahlungstrocknung. (Research on the Absorption Properties of Coats of Paint and the Heating Process in Radiation Drying.) Carl August Landfermann. *Metalloberfläche,* v. 3, June 1949, p. A126-A130.

Regardless of wave length — in most drying operations by radiation, the impermeability of the respective materials is based on absorption. However, if the material to be dried is fairly transparent, the longer wave lengths give better results.

7A-119. Finishing Fluorescent Lighting Fixtures. Robert Weber. *Industrial Finishing,* v. 25, July 1949, p. 30-32.

Cleaning, spraying, baking setup for metal fixtures. Advantage of applying hot synthetic enamel.

7A-120. Vinyls for Metal Decorating. R. A. Calsibet. *American Ink Maker,* v. 27, July 1949, p. 33-34, 59.

Including technical and economic factors.

7A-121. New Developments in Vinyl Coatings for Metal Decorating. R. A. Calsibet. *Modern Lithography,* v. 17, July 1949, p. 36-38.

Compositions, properties, and applications.

7A-122. How To Select Sprayed Metals. John E. Wakefield. *American Machinist,* v. 93, July 28, 1949, p. 80-82.

Previously abstracted from *Metal Progress,* item 7a-260, 1948.

7A-123. Porcelain Enamel as a Protective Finish. H. D. McLaren. *Enamelist,* v. 26, Summer 1949, p. 8-13.

Composition and manufacture of

porcelain enamels; application of enamel to metal; new developments; properties of porcelain enamel coatings; uses of porcelain enamel; and ceramic coatings for high-temperature applications. Article is intended primarily for sales personnel.

7A-124. Porcelain Enamel and Organic Finishes. Karl Schreiber. *Enamelist,* v. 26, Summer 1949, p. 22-25.

Comparative properties of four resinous finishes and of porcelain enamel.

7A-125. Electrostatic Glazing. Thomas A. Dickinson. *Ceramic Age,* v. 54, July 1949, p. 28-29.

Equipment and procedures for glazing metallic and nonmetallic surfaces with ceramic and organic coatings.

7A-126. Tank Linings; Principal Materials Used for Corrosive Conditions. V. Evans. *Metal Industry,* v. 75, July 29, 1949, p. 86-88.

Previously abstracted from *Journal of the Electrodepositors' Technical Society,* item 7A-111, 1949. (To be concluded.)

7A-127. Industrial Finishes and Finishing. F. G. Weed and N. P. Beckwith. *Paint and Varnish Production Manager,* v. 29, Aug. 1949, p. 208-213.

Materials and methods employed in the protective and decorative coating of common industrial products.

7A-128. Unit Operations in Name Plate Manufacture. Robert I. Shore. *Products Finishing,* v. 13, Aug. 1949, p. 18-24.

Procedures and equipment of drawn, formed, and embossed metal nameplates for the automotive, refrigerator, radio, stove, and other industries.

7A-129. Production Clinic for Finishing Die Castings. *Die Castings,* v. 7, Aug. 1949, p. 37-38.

Measuring of paint film thickness on nonmagnetic metals.

7A-130. Specification and Application of Wrinkle Finishes. William A. Waldie. *Electrical Manufacturing,* v. 44, Aug. 1949, p. 106-111, 178.

Special properties and methods of application from the standpoint of the original equipment designer. Various applications.

7A-131. How to Do Buffing and Polishing. Jerome L. Bleiweis. *American Machinist,* v. 93, Aug. 11, 1949, p. 105-112.

Details of equipment and procedures, including a discussion of the relative merits of hand or automatic polishing.

7A-132. Production of Clad Metals by Electric Fusion. *Industrial Heating,* v. 16, Aug. 1949, p. 1389-1390, 1392. Condensed from paper by R. K. Hopkins.

Method of producing composite materials for pressure vessels and other equipment. Three experimental machines were tried in the course of the development. The final design, which is in full-scale production, applies alloy cladding to the surface of the slab while in a vertical position, requiring use of a mold and four carbon steel wire electrodes.

7A-133. Evaluation of Paint Films: The Interchemical Adherometer. Clifford J. Rolle and Theresa L. Dietrich. *Analytical Chemistry,* v. 21, Aug. 1949, p. 996-997.

Method and apparatus for resolving stripping-force measurements of organic coatings on metal surfaces into their basic factors of plasticity and adhesion.

7A-134. Parts Finishing at Yale and Towne. *Iron Age,* v. 164, Aug. 25, 1949, p. 76-77.

Picture story shows spray-painting, cleaning, drying, and baking equipment used for the wide variety of parts used in industrial trucks, hoists, scales, and related products.

7A-135. Note on the Theory of Electrolytic Double Layers. A. J. Dekker. *Canadian Journal of Research,* v. 27, sec. B, July 1949, p. 682-687.

The mechanism suggested by Gurney for the formation of a double layer at the interface of a metal and a solution containing its ions is applied to a diffuse double layer. The diffuse part of the double layer is treated in a way that differs from Stern's method, leading to a more convenient formula for the potential of the diffuse part. Numerical values and a comparison with Stern's results.

7A-136. Metallizing Extends Life of Food-Processing Equipment. John Wakefield. *Food Industries,* v. 21, Aug. 1949, p. 63-66.

Procedures and applications.

7A-137. Dekapieren von Metallen mit Natriumhydrid. (Scouring Metals With Sodium Hydride.) *Metalloberflache,* v. 1, sec. B, July 1949, p. B53-B54.

Cleaning of ferrous and numerous nonferrous metals with sodium hydride and a method of generating the hydride.

7A-138. Über die Metallionenadsorption an Metalloberflächen. (The Adsorption of Metal Ions on Metal Surfaces.) Otto Erbacher, Wilfrid Herr, and Malene Widemann. *Zeitschrift für Naturforschung,* v. 3a, Dec. 1948, p. 637-645.

Radioactive indicators were used to determine the adsorption behavior of different metal ions on solid metals and liquid mercury. The method and the results. 14 ref.

7A-139. Production Line Polishing. *Western Machinery and Steel World,* v. 40, Aug. 1949, p. 78-79.

Operation of the Hill Acme polishing machine.

7A-140. Machine Finishes. C. L. Vandeman. *Machine Design,* v. 21, Sept. 1949, p. 99-104.

Selection of paints and application procedures for finishing machine tools.

7A-141. New Metallizing Techniques Offer Production Economies and Simplified Design. John E. Wakefield. *Iron Age,* v. 164, Sept. 8, 1949, p. 80-84.

See abstract from *Modern Machine Shop,* item 7A-66, 1949.

7A-142. Porcelain Enamel Process Defects; Causes and Possible Cures. Part IX. Star and Stone Marks. M. E. McHardy. *Ceramic Industry,* v. 53, Sept. 1949, p. 57.

7A-143. Tank Linings; Principal Materials Used for Corrosive Conditions. (Concluded.) V. Evans. *Metal Industry,* v. 75, Aug. 12, 1949, p. 126-128.

Previously abstracted from *Journal of the Electrodepositors' Technical Society.* See item 7A-111, 1949.

7A-144. Finishing of Wire Forms and Small Stampings. E. B. Anderson. *Products Finishing,* v. 13, Sept. 1949, p. 26-30, 32, 34, 36.

Buffing, barrel tumbling, and barrel plating of these parts, mostly steel.

7A-145. Safety Switch Finishing. H. O. Cunningham. *Products Finishing,* v. 13, Sept. 1949, p. 56-58, 60.

How mechanization of the paint department resulted in rapid, automatic finishing of switches.

7A-146. Theorie der Phosphatierung. (Theory of Phosphating.) A. Wüstefeld. *Archiv für Metallkunde,* v. 3, July 1949, p. 253-255.

The theoretical principles of phosphating in acid and in alkaline baths are the same. In both cases, the removal of H or OH ions in excess results in formation of colloids with charges opposite that of the attacked metal and, thus, in strong adherence of the film to the metal. A method for phosphating aluminum.

7A-147. (Book) **Hot-Tinning.** W. E. Hoare. 112 pages. 1948. Tin Research Institute, Fraser Road, Greenford, Middlesex, England.

Working instructions for the production of hot-tinned coatings on fabricated articles and components. Manufacture of tinplate is not included.

7A-148. Corrosion Resistance of Sprayed Metal Coating. Walter B. Meyer. *Corrosion,* v. 5, Sept. 1949, p. 282-287.

Fundamental structural features of coatings which affect mechanical properties and corrosion resistance. Metals used, applications, and advantages and disadvantages for specific uses.

7A-149. Low Pressure Spraying. Marcel L. Pouilly. *Better Enameling,* v. 20, Sept. 1949, p. 22-23, 31.

Recommendations applicable to porcelain enameling.

7A-150. Simplified Methods of Cleaning Metals for Plating. Jerome L. Bleiweis. *Materials & Methods,* v. 30, Sept. 1949, p. 74-77.

Recommendations for methods and compounds.

7A-151. Flame-Sprayed Polythene Coatings Provide Exceptional Corrosion Resistance. *Materials & Methods,* v. 30, Sept. 1949, p. 81.

Exposure tests of one year's duration have shown no deterioration by HCl, HF, H_2SO_4, and HCOOH. Polythene films, modified with graphite, were found to be free of porosity by spark tests in the neighborhood of 30,000 volts, and various other short-time exposures to a variety of chemicals have been successfully withstood.

7A-152. Chemical Polishing Puts Ax to Finishing Costs. *Modern Industry,* v. 18, Sept. 15, 1949, p. 95.

Patented method developed at Battelle Memorial Institute which requires no electrical current, and promises to eliminate the need for labor-consuming buffing operations. It may be applied to many odd-shaped parts difficult to buff. Originally developed for brass, the process is readily applied to copper and nickel-silver. Minor modifications of the bath make it suitable for monel and nickel. It may be possible to develop a bath suitable for stainless steel and perhaps even for such metals as titanium.

7A-153. Lacquers for Metals; Development of Protective Organic Films. E. S. Tonks. *Metal Industry,* v. 75, Sept. 9, 1949, p. 207-208.

7A-154. Die praktische Nutzanwendung des Metallspritzverfahrens. (Practical Applications of the Metal-Spraying Process.) H. Reininger. *Metalloberfläche,* v. 3, sec. A, Aug. 1949, p. A149-A155.

Fourth of a series. Metallizing of

metal parts as protection against corrosion and scaling or for repairs. Literature data on properties and limitations of different sprayed metals on various metallic and nonmetallic objects. 85 ref. (To be continued.)

7A-155. Cleaning Forgings. L. J. Wieschhaus. *Metal Progress,* v. 56, Oct. 1949, p. 496-497.

New method which is cheaper than pickling, tumbling, and sandblasting.

7A-156. Setting Up Polishing Wheels. *Plating,* v. 36, Oct. 1949, p. 1020-1027.

Picture story based on set-up instructions for polishing and buffing wheels by General Motors Overseas Operations.

7A-157. Latest Developments in Phosphate Coating Methods and Technique. H. A. Holden. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 111-121; discussion p. 122-128. (Preprint.)

Survey for the past five years. 20 ref.

7A-158. Turkish Bath for Metals. *DuPont Magazine,* v. 43, Oct.-Nov. 1949, p. 21-22.

Vapor degreasing with modern chlorinated solvents which increases the life expectancy of metal finishes.

7A-159. Metal Spray Repairs Hydraulic Turbine. *Power,* v. 93, Oct. 1949, p. 92-93.

Method to repair cavitation damage, which keeps sprayed metal in place.

7A-160. Selecting Economical Inorganic Finishes. Jerome L. Bleiweis. *Product Engineering,* v. 20, Oct. 1949, p. 146-150.

Economy versus utility of inorganic coatings on ferrous metals and Zn alloy die castings.

7A-161. Bright Finish for Metals. *Science News Letter,* v. 56, Oct. 8, 1949, p. 227.

New chemical polishing process developed by Battelle Memorial Institute, which is applicable to many metal products.

7A-162. Soap in Metal Treatments. Georgia Leffingwell. *Products Finishing,* v. 14, Oct. 1949, p. 24, 26, 28, 30.

Use in cleaning metal surfaces before finishing. 16 ref.

7A-163. New Method of Applying Wrinkle Paint to Castings. *Die Castings,* v. 7, Oct. 1949, p. 53-54.

The "Dipspray" process for finishing smooth surfaced castings which may be subject to porosity.

7A-164. Metallising in Relation to Foundry Practice. J. Barrington Stiles. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A202-A208; discussion, p. A209-A210.

Previously abstracted from *Foundry Trade Journal.* See item 7A-12, 1949.

7A-165. Continental Trends in Metal Finishing. W. F. Coxon. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 91-93; discussion, p. 103-108.

Personal impressions as a result of investigation tours. Anodizing and electropolishing of aluminum, phosphating, and electroplating.

7A-166. Tarnishing and Related Phenomena. U. R. Evans. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 179-184; discussion, p. 209-213.

Previously abstracted from *Sheet Metal Industries.* See item 7-464, 1947.

7A-167. Chemical Cleaning of Heat-Exchange Equipment. C. M. Loucks and C. H. Groom. *Transactions of the American Society of Mechanical Engineers,* v. 71, Oct. 1949, p. 831-836.

Use of chemical solvents—types of deposits, solvents available, and metals encountered. A number of case histories illustrating chemical cleaning in various industries. 16 ref.

7A-168. Stop Corrosion With Sprayed-On Zinc. John E. Wakefield. *Refrigerating Engineering,* v. 57, Oct. 1949, p. 982-985.

Use in factory and field for protecting refrigeration equipment.

7A-169. Refinishing Metal Ware; Stripping—Polishing—Cleaning—Replating. J. Haas. *Metal Industry,* v. 75, Oct. 7, 1949, p. 289-290. Condensed from *Metal Finishing.*

Recommended procedures.

7A-170. Large Overhead Drying Oven Features the Kaiser-Frazer Interior Trim Hardware Finishing Line. *Industrial Heating,* v. 16, Oct. 1949, p. 1824-1828, 1830, 1838.

7A-171. Porcelain Enamel Process Defects: Causes and Possible Cures. Part XI. Eggshelling, Orange Peel. M. E. McHardy. *Ceramic Industry,* v. 53, Nov. 1949, p. 59, 61.

7A-172. Metal Plating From Carbonyl Gases. *Chemical Engineering,* v. 50, Oct. 1949, p. 118-119.

Gives details of process and experimental work being done. Compared with electroplating, gas plating is said to be faster, give better reproduction of irregular surfaces, and to be applicable to nonconductors such as wood and glass.

7A-173. Materials Used in Polishing and Buffing. *Plating,* v. 36, Oct. 1949, p. 1012-1018; Nov. 1949, p. 1127-1130.

Oct.: polishing wheels, buffs, abrasive coating for polishing wheels, and bonding agents. Nov.: glue for setting up polishing wheels; polishing and buffing compounds. General Motors standards are given.

7A-174. Preparation of Wheels for Polishing and Buffing. *Plating,* v. 36, Nov. 1949, p. 1132-1135.

Procedures of General Motors Overseas Operations, for putting polishing wheels into operation, reconditioning of used polishing wheels, and preparation of buffs for buffing.

7A-175. Recent Developments in Determining Degree of Surface Cleanliness. Allen G. Gray. *Products Finishing,* v. 14, Nov. 1949, p. 70, 72, 74, 76, 78, 80, 82, 84, 86.

7A-176. Testing Organic Finishes. *Die Castings,* v. 7, Nov. 1949, p. 43-46, 48.

Developments as applied to finishes on metal products.

7A-177. Some Aspects of De-Burring and Polishing in Barrels. Hans Weiss. *Journal of Electrodepositors' Technical Society,* v. 24, 1949, p. 171-180. (Preprint.)

The barrelling process and its effects on different surfaces. Newer methods. A variety of articles of substantial size and weight can be treated in barrels under appropriate conditions.

7A-178. Pre-Finishing Surface Requirements for Mill Forms. Edward Engel. *Tool Engineer,* v. 23, Nov. 1949, p. 37-38.

For die castings, investment castings, permanent-mold castings, extruded shapes, and impact operations. Includes table of forging operations and equipment.

7A-179. A Review of De-Enameling Practice. G. H. Spencer-Strong. *Finish,* v. 6, Nov. 1949, p. 33-34, 67-68, 70.

Detailed accounts of various methods.

7A-180. Electrical Measurements on Metal Protective Paints. W. E. Shaw and D. L. Hawke. *Organic Finishing,* v. 10, Oct. 1949, p. 19-22.

Measurements of bulk potential, resistance, and capacitance or dielectric constant have been used for evaluating metal protective paints. These three types of measurements as related to metal protective paints on steel. The experimental setup. An explanation of the source of certain of the phenomena measured.

7A-181. Electro-Metallizing Techniques. Thomas A. Dickinson. *Ceramic Age,* v. 54, Oct. 1949, p. 204-206.

"Cathode sputtering" and "evaporation coating", related processes used for applying both transparent and opaque metal coatings to glass, and other ceramic-product surfaces.

7A-182. Heatless De-Greasing in 10 Seconds by Ultrasonic Waves. *Factory Management and Maintenance,* v. 107, Nov. 1949, p. 130.

How an ordinary caustic cleaning solution can remove either heavy or light grease from steel parts in 10 sec. by use of ultrasonic vibrations.

7A-183. Protective Metal Finishes for Radio and Electrical Equipment. A. G. Sussex. *Department of Supply and Development, Munitions Supply Laboratories, Commonwealth of Australia,* Circular 9, Mar. 1948, 38 pages.

Selection and use of electroplated and chemical surface finishes for tropical areas. Corrosion protection problems encountered during the New Guinea campaign. Methods for coating steel which afford either electrochemical or mechanical protection of nonferrous alloys.

7A-184. Adherence of Glass to Metal. Joseph A. Pask. *Better Enameling,* v. 20, Nov. 1949, p. 6-7, 31.

Existing theories for this phenomenon, and their limitations. Proposes modified theory based on the older ones.

7A-185. Est-il possible de calculer la vie de peintures anti-rouille par l'examen de couches minces? (Is It Possible to Calculate the Life of Anti-Corrosion Paints by Investigation of Their Thin Films?) J. F. Bogtstra. *Métaux & Corrosion,* v. 25, June 1949, p. 157-162.

Relationship between thickness of the paint film and protective ability. Results indicate possibility of approximate calculation by use of coefficients for paint composition and corroding medium. Error is up to 20-25%.

7A-186. Les propriétés des métaux projetés au pistolet métalliseur à fil. (Properties of Metals Deposited by Means of a Wire-Fed Metallizing Gun.) J. Cauchetier and J. Grilliat. *Soudure et Techniques Connexes,* v. 3, July-Aug. 1949, p. 175-178.

Metals used in the experimental investigations (aluminum, copper, brass, bronze, and steel) possess specific properties quite different from those of the same metals in bulk form. This is due to the fact that spray-deposited metals have a stratified structure, slight porosity, and contain a certain amount of oxides.

7A-187. Décapants pour le brasage. (Pickling Agents for Brazing.) *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 3, Mar. 1949, p. 52.

Composition of different pickling agents successfully used in soft and hard brazing in Switzerland. Applications.

7A-188. Electrochemical Method for Determining Anti-Corrosive Properties of Lacquer Films. (In Russian.) M. M. Gol'dberg and N. D. Tomashov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 951-955.

New method based on use of a lacquered iron cathode and a plain zinc anode in 3% KCl solution. This method makes possible rapid determination of the influence of pigment layer on retardation of the cathodic process, which is directly related to the protective properties of a given coating. A special method for measuring the voltage of several pairs of electrodes without breaking the circuit.

7A-189. Natürliche und synthetische hochpolymere Stoffe als Korrosionsschutz. (Natural and Synthetic High-Polymers as Corrosion Resistant Materials.) St. Reiner. *Kautschuk und Gummi*, v. 1, July 1948, p. 177-181.

Types of coatings, methods of coating, and their adhesive and chemical properties (especially resistance to corrosive agents).

7A-190. (Book) **The Science of Wrinkle Finish.** W. A. Waldie. Research Press, Inc., 137 N. Perry St., Dayton, Ohio. $5.00.

Origin and characteristics of the process; special pattern formulations and techniques for applications. Intended primarily as a production man's guide. Majority of topics relate to specific techniques of application, ingredients, and processing and equipment.

7A-191. (Book) **Metal Finishing Guidebook-Directory. Ed. 18.** 468 pages. 1949. Finishing Publications, Inc., 11 W. 42nd St., New York 18, N. Y. $2.00.

Practical information on electroplating, cleaning, polishing, buffing, and related subjects. Finishing plant engineering, including layout, heating methods for plating solutions, and automatic controls. Includes a directory of suppliers and manufacturers of equipment and materials and a list of trade names.

7A-192. How Alloy Iron Ring Lands Are Bonded to Aluminum Pistons. Charles R. Coffey. *Automotive Industries*, v. 101, Nov. 15, 1949, p. 30, 88, 90.

In some cases, for instance, high-performance, two-stroke diesels, top-ring groove wear in light-alloy pistons is a major problem. Use of the "Al-Fin" process by United Engine and Machine Co. In this process, Al is cast about a ferrous metal part which has been tinned with a coating of ferro-aluminum alloy so that the Al fuses with the alloy to present a continuous metal phase between the dissimilar metals.

7A-193. Maroon Crackle Finish on Motorola Portable Radios. W. E. Smith. *Industrial Finishing*, v. 26, Nov. 1949, p. 24-26, 29-30.

Operations include two-stage metal cleaning; electrostatic spraying of primer; hand spraying a coat of crackle lacquer; air drying; top coat of maroon-colored enamel; oven bake; pen marking the dials, and finishing them with gold-tinted lacquer.

7A-194. How We Finish Compacts. A. A. Oertel. *Industrial Finishing*, v. 26, Nov. 1949, p. 36-38, 40, 42, 44.

How ladies' compacts are automatically buffed; cleaned in solvents, dipped in clear lacquer, and baked in a controlled electric oven.

7A-195. Cleaning-Painting Setup for Metal Toys. F. C. Tanessferro. *Industrial Finishing*, v. 26, Nov. 1949, p. 50, 52.

Completely conveyorized set-up that includes two-stage cleaning, dip coating in colors, and infrared oven drying, with transferring at two stations.

7A-196. Tin Coatings in the Wire Industry. Frederick A. Lowenheim and Herbert E. Hirschland. *Wire and Wire Products*, v. 24, Nov. 1949, p. 1028-1032, 1068-1069.

Various methods for applying tin coatings, including aqueous immersion, electroplating, and fused-salt tinning. Bath compositions. Deals with both steel and copper wire.

7A-197. Complete Finishing System at Morton Manufacturing Company. *Industrial Heating*, v. 16, Nov. 1949, p. 2017-2020, 2022, 2024, 2026, 2028, 2082, 2084, 2086.

Equipment for cleaning, enamel painting, and drying applied to miscellaneous metal railway-car and kitchen equipment.

7A-198. Du Pont Research at Last Finds a Way to Line Tanks With Teflon. E. C. Fetter. *Chemical Engineering*, v. 56, Nov. 1949, p. 120-124.

Sprayed plastic lining which resists practically all chemicals up to 500° F. and which is competitive with glass and rubber linings. Presented in the form of questions of the author and answers obtained during a number of meetings and telephone conversations with Du Pont representatives.

7A-199. The Vapor-Phase Deposition of Refractory Materials. I. General Conditions and Apparatus. I. E. Campbell, C. F. Powell, D. H. Nowicki, and

B. W. Gonser. *Journal of the Electrochemical Society,* v. 96, Nov. 1949, p. 318-333.

See abstract of condensed version in *Iron Age,* item 7A-89, 1949.

7A-200. Chemical Polishing of Metal Products. Russell L. Deubner. *Finish,* v. 6, Dec. 1949, p. 19-20.

New process developed at Battelle Memorial Institute by which metal products can be given a bright, reflective surface without mechanical or electrical operations. The product is merely dipped into a chemical solution. When withdrawn a few minutes later, it is polished to a smooth, highly reflective luster. Major advantages are simplicity and nonetching character of the solution. Metals to which the process is applicable include brass, copper, nickel silver, monel, nickel, and aluminum.

7A-201. Spraying Technique for Porcelain Enamels and Synthetic Finishes. M. L. Pouilly. *Finish,* v. 6, Dec. 1949, p. 31-32, 70, 72.

"Low-pressure" spraying for porcelain enamels and pointers on control of spraying technique for synthetic finishes.

7A-202. Adherence of Glass to Metal. Joseph A. Pask. *Finish,* v. 6, Dec. 1949, p. 41, 68-69.

Previously abstracted from *Better Enameling.* See item 7A-184, 1949.

7A-203. How To Apply Metal Coatings by Vacuum Evaporation. *Steel,* v. 125, Dec. 12, 1949, p. 84-87, 115-116.

Commercial procedures, equipment, and applications of relatively new technique.

7A-204. Metal Polish Formulations. Cornelia T. Snell. *Chemical Industries,* v. 65, Nov. 1949, p. 742, 744, 746.

History, production, and metallic and nonmetallic uses. 14 ref.

7A-205. Porcelain Enamel Process Defects: Causes and Possible Cures. Part XII. M. E. McHardy. *Ceramic Industry,* v. 53, Dec. 1949, p. 62-63.

Low acid resistance of ordinary enamels; defects of titanium enamels. Low acid resistance, black specks, tearing, color variation, lumps, and rough surface.

7A-206. Metal Spraying Costs. L. E. Kunkler. *Welding Engineer,* v. 34, Dec. 1949, p. 28-29.

Tables help to calculate operating costs, speeds, thickness per lb. of sprayed metal, and amount of metal required to spray a cylindrical surface of given diameter.

7A-207. Die Entwicklung der Metallspritztechnik seit dem Jahre 1938. (Development of Metal Spraying Technique Since 1938.) K. Krekeler. *Schweissen und Schneiden,* v. 1, Sept. 1949, p. 153-158.

64 references.

7A-208. The Mechanism of the Protective Action of an Unpigmented Film of Polystyrene. J. E. O. Mayne. *Journal of the Oil & Colour Chemists' Association,* v. 32, Oct. 1949, p. 481-487.

The diffusion of water, oxygen, and chloride ions through the above film to the steel base was studied in order to determine mechanism of corrosion prevention. 10 ref.

7A-209. Blistering of Paint Films on Metal Under Sub-Marine Conditions. P. J. Gay. *Journal of the Oil & Colour Chemists' Association,* v. 32, Oct. 1949, p. 488-498.

Mechanism and character were studied experimentally. Composition of fluid in blisters in paint films on steel; behavior of paint and varnish films on steel and glass during immersion in liquids of different types; and relation between corrosion of painted steel and film blistering. Observations were made on panels immersed in the sea and under accelerated laboratory conditions.

7A-210. Polishing Metals Prior to Finishing. Edward Engel. *Tool Engineer,* v. 23, Dec. 1949, p. 38-40.

Recommended procedures. Methods and apparatus for measurement of surface smoothness. Terms used in surface-finishing work. Merits of different abrasives for different jobs.

7A-211. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Dec. 1949, p. 16-17.

Defects in porcelain enamel known as lumps, boiling, and reboiling. Causes and remedies.

7A-212. Sprayed "Envelopes" Protect Aircraft Skins. *Aero Digest,* v. 59, Dec. 1949, p. 38-39.

Use of sprayed plastic coatings for protection during secondary working operations such as forming, bending, dimpling, and riveting. The coating is stripped after completion of assembly.

7A-213. Battelle Research Aids the Finishing Industry. R. O. Stith. *Products Finishing,* v. 14, Dec. 1949, p. 52-57.

Varied facilities of Battelle Memorial Institute for research in metallic and nonmetallic coatings and their application.

7A-214. Naval Engineering Duty in Peacetime. Richard Doughton, Jr. *Metal Progress,* v. 56, Dec. 1949, p. 829-832.

Some of the engineering work in connection with maintenance of inactive Naval vessels, especially prevention of corrosion and other deterioration.

7A-215. Friden Adopts Electro-Sprayed Wrinkle Finish. F. B. Shear. *Iron Age,* v. 164, Dec. 15, 1949, p. 83-85.

A 300% increase in output, a decrease in rejects, and more good parts per gallon of paint. Procedure and layout.

7A-216. Spraying Paint With Steam. *Iron Age,* v. 164, Dec. 15, 1949, p. 95.

Process using superheated steam instead of compressed air, said to offer several advantages over conventional paint-spraying methods.

7A-217. Production of Composite Materials by Electric Fusion Process. R. K. Hopkins. *Electric Furnace Steel Proceedings,* v. 6, 1948, p. 75-88; discussion, p. 88-90.

Previously abstracted from *Industrial Heating,* item 7A-132, 1949.

7B—Ferrous

7B-1. Aluminum Coating Steel. C. B. Ulshafer. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1124-1125.

Various methods, their advantages and disadvantages. Need for further research. States that "a market is ready and waiting for the commercial advent of aluminum-coated steel".

7B-2. Manual Pickling Operation. A. M. Langbein. *Industrial Heating,* v. 15, Dec. 1948, p. 2158-2161. A condensation.

Equipment for manual pickling of metal prior to porcelain enameling.

7B-3. A Survey of Drying Practices in the Porcelain Enamel Industry. George N. Tuttle. *Better Enameling,* v. 19, Dec. 1948, p. 8-12, 32.

7B-4. Application of Cover Coats Directly on Steel. M. E. McHardy. *Better Enameling,* v. 19, Dec. 1948, p. 14-15, 33.

Use of titanium-containing killed steel in production of porcelain-enameled parts, using zirconium cover coat. Pickling, spraying, and firing methods.

7B-5. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 19, Dec. 1948, p. 22-23.

Continues series on porcelain enamel defects and their prevention. Deals with poor adherence of blue ground coat and ground coat color (darker or lighter than normal).

7B-6. Rustproofing Steel Parts. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 90-91.

Equipment and procedures of California Parkerizing Co. Operations fall into four basic categories: Parkerizing, Bonderizing, Parco Lubrizing and baked enameling.

7B-7. First Things First, in Silver Plating. James E. Bottomley. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 766-768.

The preparation of metal surfaces for silver plating from the practical standpoint.

7B-8. Modern Heat Applications in Galvanizing. W. O. Owen. *Steel Processing,* v. 34, Dec. 1948, p. 659-662.

Various methods and equipment for heating galvanizing kettles. Advantages and limitations of each.

7B-9. Flame Peeling Removes Mill Scale. L. D. Robson. *Power,* v. 93, Jan. 1949, p. 103.

Brief application of hot flame cleans boiler tubes quickly before installation, thus minimizing localized electrolytic attack during service.

7B-10. Driving and Controlling A Modern Strip Pickling Line. J. Raymond Erbe. *Iron Age,* v. 163, Jan. 13, 1949, p. 46-50.

Three separate adjustable-voltage drives, with acceleration and retardation automatically handled by a Rototrol system, are used in the new line at the Aliquippa plant of Jones & Laughlin Steel Corp.

7B-11. Special Steels and Their Preparation for Enameling. Frank R. Porter. *Better Enameling,* v. 20, Jan. 1949, p. 17-19.

Special attention to zirconium and titanium oxide enamels.

7B-12. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Jan. 1949, p. 28-29.

The enameling defect known as "copperhead."

7B-13. How to Apply Titanium Enamel to Titanium Steel. John C. Swartz. *Steel,* v. 124, Jan. 17, 1949, p. 64-65, 96.

Previously abstracted from *Better Enameling.* See item 7b-218, 1948.

7B-14 (Book). **A Manual of Porcelain Enameling.** Abridged Ed. 127 pages. Enamelist Publishing Co., 4510 E. 56th St., Cleveland 5, Ohio. $1.00.

Contains charts, graphs, and other useful data.

7B-15. Specially-Designed Building Facilitates Sandblasting of Railroad Cars. *Steel,* v. 124, Jan. 24, 1949, p. 66.

Unit used in preparation for rustproofing and painting at plant of American Car & Foundry Co.

7B-16. Plastic Protection of Oil Well Drilling Pipe. H. Seymour. *Mine & Quarry Engineering,* v. 15, Jan. 1949, p. 20-22.

Results of laboratory and field tests on the above, also the coating procedure adopted.

7B-17. One-Fire White Enamels. Burnham W. King and C. Wesley Stull. *Journal of the American Ceramic Society,* v. 32, Jan. 1, 1949, p. 34-40.

Reactions and changes taking place during firing. Several possible steel and enamel combinations. The reflectance and chemical resistance of various white enamels fired at 1300 and 1500° F. 18 ref.

7B-18. Conveyorized Galvanizing. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 78-80.

Galvanizing equipment and procedures in production of hot water and other tanks.

7B-19. Galvanized Welds. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 90-91.

Method for weld assembly of galvanized members, for their repair, and also for regalvanizing of worn areas. The process, known as "Galv-Weld," requires no flux, needs no sandblasting, makes no fumes, won't peel or chip, and makes a bond to the base metal that is superior to zinc-metal spray.

7B-20. Chromizing at 1700° to 1850° F. *Iron Age,* v. 163, Jan. 27, 1949, p. 65.

Chromizing process introduced in this country by Diffusion Alloys Corp. The parts to be treated are packed in conventional pack-carburizing containers, along with a ferrochromium base material and a suitable catalytic agent, and heated to 1700 to 1850° F., depending upon carbon content. Preliminary tests indicate promising corrosion resistance, heat resistance, and wear resistance characteristics.

7B-21. Applying Titanium Enamels Direct to Titanium Steels. *Iron Age,* v. 163, Jan. 27, 1949, p. 77-78. Condensed from article by J. L. Lannan.

See abstract from *Better Enameling;* item 7b-217, 1948.

7B-22. Galvanizing Spring Wire. *Wire Industry,* v. 16, Jan. 1949, p. 56.

Merits of hot dipping and electrodeposition of zinc on the above.

7B-23. The Acid Question—Hydrochloric and Sulphuric. *Wire Industry,* v. 16, Jan. 1949, p. 60.

Relative merits of the two acids as wire pickling agents.

7B-24. Porcelain Enameled Saggers Withstand Prolonged Furnace Service. *Finish,* v. 6, Feb. 1949, p. 35.

Carbon brushes are enclosed in small steel cylinders ("saggers") during a 5-day firing process at Speer Carbon Co. Porcelain enameling prevented rapid deterioration which otherwise took place due to blistering and scaling. Other advantages.

7B-25. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. I. (Pickling, Etching, Pretreating, Rust-Removing, and Rust Preventive Agents. I.) Richard Springer. *Metalloberfläche,* v. 2, May-June 1948, p. 123-130.

A summary report on the advances made in the years 1935 to 1943. Consists of brief abstracts of specific publications (mainly German). (To be continued.)

7B-26. The Sodium Hydride Process. A New Method of Descaling Metals. N. L. Evans. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 9-13; discussion, p. 14-15. (Reprint.)

The process and its advantages.

7B-27. Base Metal Selection Important to Successful Porcelain Enameling. Frank R. Porter. *Materials & Methods,* v. 29, Feb. 1949, p. 62-64.

The four classes of ferrous sheet commonly used; their drawing and enameling properties and their resistance to sagging and warping.

7B-28. Factors Affecting Bubble Formation in Vitreous Enamels. J. A. Clarke. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1609-1614.

Results of an experimental study of the above. Effects of various factors are shown by photomicrographs.

7B-29. Clean Iron and Steel Surfaces; Some Fundamental Considerations With Particular Reference to Vitreous Enamelling. T. P. Hoar. *Sheet Metal Industries,* v 25. Sept. 1948, p. 1805-1808, 1826.

The functions of the various degreasing, pickling, and rinsing processes from the fundamental point of view. Restricted to chemical cleaning.

7B-30. Some Notes on the Uses and Effects of Inhibitors in the Acid Pickling of Iron and Steel. Paul De Lattre. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 1961-1964; Nov. 1948, p. 2181-2188.

Present status of theory and practice. Attempts a logical classification of known inhibitors. Extensive annotated bibliography of patent and journal literature.

7B-31. An Investigation into Some Physical Properties of Vitreous Enamels. J. H. Partridge. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2225-2229, 2240.

Differences in thermal expansion between iron and enamel were much greater than those found between the pairs of glass-metal seals, which must result in high stresses in enamels. No evidence of an oxide

film between iron and enamel was detected, but gamma-iron crystals were found. Methods sometimes used to increase strength of glass-metal seals were unsuccessful for enamels.

7B-32. Some Chemical Aspects of Opacification of Vitreous Enamels. J. M. Stevels. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2234-2237, 2240.

Fundamental factors which govern opacification. General principles; types of opacifiers; influence of dispersed phase on opacity; and influence of vitreous phase on opacity. Reasons for the high refractive index of TiO_2.

7B-33. "Nitralising": A Pre-Enameling Treatment for Steel Sheets. T. Gilbertson and R. Robinson. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2238-2240.

Defects commonly encountered in enameling practice, and their causes and remedies. "Nitralising" consists of degreasing and acid pickling followed by immersion in fused sodium nitrate at about 500° C. On removal the metal is cooled, rinsed, again pickled a few minutes, and given a final rinse.

7B-34. The Influence of Certain Compounds of Lithium in Vitreous Enamels. Walter M. Fenton and Paul A. Huppert. *Sheet Metal Industries,* v. 25, Nov. 1948, p. 2255-2259.

The relationship between lithia and metallic oxides commonly used in ceramics, especially porcelain-enamel frits. Lithium carbonate was reacted at varying temperatures in the solid phase with the following compounds: Al_2O_3, Sb_2O_3, B_2O_3, CO_3O_4, MnO_2, MoO_3, SiO_2, TiO_2, ZrO_2, and $ZrSiO_4$. Results of plant tests; single-coat acid resistant ware; and white cover-coat enamels. 10 ref.

7B-35. The Relative Merits of Sulphuric and Hydrochloric Acids for Pickling. J. H. G. Willan. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2415-2418.

7B-36. The Influence of Titanium and Nitrogen on the Galvanising Properties of Iron Sheets. Heinz Bablik. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 149-151.

Fundamentals; microstructures produced under various conditions.

7B-37. Finishing Automobile Components at the Kaiser-Frazer Plant. *Industrial Heating,* v. 16, Jan. 1949, p. 106-110, 112, 114, 116.

7B-38. Progress in Developing Palm Oil Replacements. E. L. H. Bastian. *Steel,* v. 124, Feb. 14, 1949, p. 84-88, 124.

Selection and properties of tinning oils. Experimental work at Battelle Memorial Institute under sponsorship of Shell Oil Co. has resulted in development of a mineral-base tinning oil and a make-up or replenishment oil. Advantages over palm, tallow, and other fixed oils used in hot tinning; results of full-scale production tests. Tinplate quality, lacquer adherence, and porosity were also satisfactory. A substitute for palm oil for grinding and polishing stainless-steel sheets.

7B-39. Preparing Special Steels for Enameling. Frank R. Porter. *Steel,* v. 124, Feb. 14, 1949, p. 90-92.

Emphasis on titanium enameling steel. Techniques developed for surface preparation of such steel, including experiences with welded areas.

7B-40. Titanium Enamels—A Review of a Big Forward Step. Burnham W. King. *Ceramic Industry,* v. 52, Feb. 1949, p. 66-67.

15 references.

7B-41. The Bending Qualities of Hot Dip Zinc Coatings. Wallace G. Imhoff. *Metal Finishing,* v. 47, Feb. 1949, p. 65-68, 75.

Factors which affect the above. Break test for lead content; effects of various metals in the coating; recommended coating procedures.

7B-42. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Feb. 1949, p. 22-23.

Methods of correcting blister and burn off surface defects in porcelain enamels.

7B-43. Finishing Parts for Thor Washing Machines. Fred M. Burt. *Industrial Finishing,* v. 25, Feb. 1949, p. 34-36, 38, 40.

Highlights of conveyerized setup are thorough cleaning and surface-treating of metal parts, prime coating by dipping, final spray coating with heated white enamel, and oven baking.

7B-44. Progress of Fluxing in Hot Galvanizing. *Industrial Heating,* v. 16, Feb. 1949, p. 264, 266, 268, 270. Condensed from paper by A. T. Baldwin.

Progress of past 11 years.

7B-45. Finishing Automobile Components at the Kaiser-Frazer Plant: II. *Industrial Heating,* v. 16, Feb. 1949, p. 294-296, 298-304.

7B-46. Effect of Refractory Mill Additions on Molten Apparent Viscosities of Steel Ground-Coat Enamels. B. D. Bruce and A. V. Sharon. *Journal of the American Ceramic Society,* v. 32, Feb. 1, 1949, p. 41-45.

Rotating-cylinder type viscosimeter and procedure used to determine the above. A blend of three commercial frits was used as the base enamel to study the effect on molten viscosity of various amounts of silica, feldspar, and nepheline syenite.

7B-47. Chromizing With Chromium Chloride. *Iron Age,* v. 163, Feb. 24, 1949, p. 100. Based on article in *Iron and Coal Trades Review,* Jan. 14, 1949 (taken from *Technische Rundschau).*

Method of diffusing chromium into the surface of steel. Steel pieces to be treated are packed in ceramic bodies impregnated with chromium chloride, and heated in a furnace.

7B-48. Metal Finishing Process Information Sheets. IV. George Black. *Product Engineering,* v. 20, Mar. 1949, p. 163.

Processes for steel finishing known as Thermoil-Granodine, Houghto-Black, Parkerizing, and Banox are presented in outline form.

7B-49. Reconditioning Flues in the Louisville and Nashville South Louisville Shops. Fred W. Vogel. *Modern Machine Shop,* v. 21, Mar. 1949, p. 98-102, 104, 106, 108, 110, 112, 114-115.

Descaling, repairing, and testing of flues using specially designed tools and work-handling equipment.

7B-50. Burning Tool Equipment for Porcelain Enameling Steel. A. Rasmussen. *Steel Processing,* v. 35, Feb. 1949, p. 79-81, 103.

7B-51. Porcelain Enamel Process Defects; Causes and Possible Cures. Part VIII. Fishscale, Adherence. M. E. McHardy. *Ceramic Industry,* v. 52, Mar. 1949, p. 80-81.

7B-52. Is Architectural Porcelain Enamel a Logical Building Material? Roy E. Dybvig. *Finish,* v. 6, Mar. 1949, p. 34-35, 42.

Qualifies affirmative answer with outline of manufacturing recommendations.

7B-53. An Investigation of the Possibilities of Organic Coatings for the Prevention of Premature Corrosion-Fatigue Failures in Steel. Robert C. McMaster. American Society for Testing Materials, Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 20 pages; discussion, p. 18-20.

A few readily available organic coatings were investigated. Intact organic coatings might provide great help, but after failure of the organic coatings, the remaining operating lifetime was found to be about the same duration as that of new, bare specimens. 14 ref.

7B-54. Modern Porcelain Enameling. III. Preparation of Metal. Part II. Alexis J. Hannan and Lee R. Fuller. *Ceramic Industry,* v. 52, Mar. 1949, p. 82.

Equipment used in chemical cleaning or pickling. (To be continued.)

7B-55. Finishing the Lustron Home. Part I. Ezra A. Blount. *Products Finishing,* v. 13, Mar. 1949, p. 20-28.

Flow-coat painting installation of the Lustron Corp.

7B-56. Processing of Titanium Enamel Direct to Titanium Steel. John L. Lannan. *Products Finishing,* v. 13, Mar. 1949, p. 40, 42, 44, 46, 48, 50, 52, 54.

See abstract of article in *Better Enameling,* item 7b-223, 1948.

7B-57. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Mar. 1949, p. 28.

Typical bare spots in enameled ware and their causes.

7B-58. The Modern Porcelain Enamel Research Laboratory. G. H. Spencer-Strong. *Finish,* v. 6, Apr. 1949, p. 37-38, 73.

Laboratory of Pemco Corp., Baltimore.

7B-59. Automatic Paint Booth Gives Steel Barrel Manufacturer "Pushbutton" Operating Advantages. *Steel,* v. 124, Mar. 28, 1949, p. 82, 98, 101.

Installation and operation of booth.

7B-60. Preparing Cast Iron Surfaces for Bonding. J. H. Shoemaker. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 199-205; discussion, p. 205-207.

General methods. Two new processes developed by Kolene Corp. are the molten-salt-bath and the electrolytic molten-salt-bath methods. Structure of the bond obtained.

7B-61. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. (Pickling, Etching, Pretreating, Rust Removal, and Rust Preventives.) II and V. Richard Springer. *Metalloberfläche,* v. 2, Sept. 1948, p. 199-203; v. 3, Feb. 1949, p. 45-50.

Reviews patent and other literature for the years 1935 to 1943.

7B-62. Mechanical Aspects of Pipe-Line Coatings. L. F. Sherer and O. C. Mudd. *Oil and Gas Journal,* v. 47, Mar. 31, 1949, p. 119-122.

Properties of various types, service results, recent developments, application procedures, and pipe preparation for coating.

7B-63. Finishing Automobile Components at the Kaiser-Frazer Plant. III. (Concluded.) *Industrial Heating,* v. 16, Mar. 1949, p. 480-482, 484.

Operations and equipment for finishing fenders, hoods, grilles, wheels, and other small parts.

7B-64. Vitreous Enamelling in White and Pastel Colours Without a Groundcoat. *Electroplating and Metal Finishing,* v. 2, Mar. 1949, p. 187-188.

Use of zirconium steel as a solution to the above problem.

7B-65. Effect of Temperature on the Rate of Blister Failure of Finishes on Steel in Water Immersion Tests. J. A. Boylan and R. I. Wray. *ASTM Bulletin,* Mar. 1949, p. 53-55.

Data obtained during cooperative test program. Temperatures of 100, 110, and 120° F. were used.

7B-66. Clad Steel Plate. F. R. Pattison. *Metallurgia,* v. 39, Mar. 1949, p. 269-271.

Various fabrication methods, properties, and applications.

7B-67. Special Oxide Film on Steel Provides Electrical Insulation. P. L. Schmidt. *Materials & Methods,* v. 29, Apr. 1949, p. 54-56.

See abstract from *Electrical Engineering,* item 7b-109, 1948.

7B-68. Houses for the Homeless. *Production Engineering & Management,* v. 23, Apr. 1949, p. 57-64.

Plant layouts and processes from the time raw material arrives until fabricated parts are loaded, used by Lustron, makers of enameled-steel prefabricated homes.

7B-69. The Production of the Industry's Only All-Porcelain Automatic Clothes Washer. *Better Enameling,* v. 20, Apr. 1949, p. 8-16.

Forming, pickling, enameling, firing, assembly, and inspection operations.

7B-70. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Apr. 1949, p. 36-37.

Enamel defects known as spongy texture and fishscale. Recommended remedies.

7B-71. Chemical Scuff Resistant Coatings for Ferrous Parts. George Black. *Product Engineering,* v. 20, Apr. 1949, p. 138-141.

Test and performance data on manganese iron phosphate, iron oxide, and iron sulfide coatings, with respect to effectiveness, application, and ease of production.

7B-72. Modern Porcelain Enameling. Chapter III. Part II. (Continued.) Alexis J. Hannan and Lee R. Fuller. *Ceramic Industry,* v. 52, Apr. 1949, p. 91-93.

Metal-preparation equipment, solutions, and procedures. Mechanical and chemical methods, and use of bright annealing to replace conventional methods. (To be continued.)

7B-73. How to Prevent Defects in Porcelain Enameling Holloware. Part IX. Application—Streaks and Rundowns. F. A. Petersen. *Ceramic Industry,* v. 52, Apr. 1949, p. 96-97.

Practical recommendations.

7B-74. Porcelain Enamel Process Defects—Causes and Possible Cures. Part IX. Pits and Scumming. M. E. McHardy. *Ceramic Industry,* v. 52, Apr. 1949, p. 98.

7B-75. Porcelain Enameling at Lustron. E. E. Howe. *Iron Age,* v. 163, Apr. 14, 1949, p. 72-75.

Equipment and procedures of world's largest porcelain enameling installation. Because of the low firing temperature, enameling of regular auto-body stock rather than premium-quality enameling iron has proved practical.

7B-76. Corrosion-Proofing Simplified by Liquid Zinc-Content Coating Applied Like Paint. John R. Fisher, Jr. *Steel,* v. 124, Apr. 25, 1949, p. 80-82.

Coating, its advantages over other protective methods, its life expectancy, surface preparation, and undercoating.

7B-77. "10% Formula and 90% Application"—Key to Enameling Unusual Production Equipment Successfully. Herbert R. Spencer. *Ceramic Industry,* v. 52, May 1949, p. 56-59.

Procedures and miscellaneous pieces of industrial equipment enameled by Erie Enameling Co.

7B-78. The Trend Toward Lower-Firing Enamels. E. J. Kelly and G. E. Miller. *Enamelist,* v. 26, Spring 1949, p. 3-7.

Development of enamels for firing at 1350 and 1450° F.

7B-79. Facia Panel Manufacture. *Automobile Engineer,* v. 39, Apr. 1949, p. 164-166.

Procedures for bonding of wood veneer to steel by use of "Redux" liquid-resin adhesive, for automobile instrument panels or dashboards.

7B-80. Automatic Paint Booth and Drying Oven Speed the Finishing of Steel Barrels. *Industrial Heating,* v. 16, Apr. 1949, p. 667-668, 670, 672, 674, 676.

7B-81. Automatic Spraying; Metallic Protection of Constructional Steelwork. *Iron and Steel,* v. 22, Apr. 1949, p. 121-123.

Application of sprayed Al or Zn to structural steel and the new plant for cleaning and spraying the steel members—said to be the first of its kind in the world.

7B-82. Porcelain Enamel Murals in Architecture. Edward Winter. *American Ceramic Society Bulletin,* v. 28, Apr. 15, 1949, p. 162-163.

Properties and applications.

7B-83. Admiral Corp. Develops Tests for Enamel Spalling in Cold-Wall Refrigerators. *Ceramic Forum,* v. 16, Apr.-May 1949, p. 7, 9.

A recent innovation in refrigerators is simultaneous operation of a freezing unit and a nonfrosting preserving unit. Enameled surfaces subjected to this temperature gradient have a tendency to spall. Test apparatus which varies test-plate temperature from 28 to 36° F. 300-600 times per 24 hrs. Zirconia, antimony, and titania enamels were studied. The spalling tendency was found to be related to the existence of subsurface bubbles. An HF-etching test was developed which makes possible prediction of spalling characteristics.

7B-84. Evolution of an Enameling Plant for Electric Range Production. R. T. Goldthwaite. *Finish,* v. 6, May 1949, p. 19-22.

General information on fabrication, assembly, and handling methods.

7B-85. Simple Automatic Spraying Device. Herbert Chase. *Products Finishing,* v. 13, May 1949, p. 36, 38, 40.

Procedure for finishing bumper guards. They slide down a chute, moving gates that operate a spray gun through a micro switch and solenoid.

7B-86. Hot-Dipped Aluminum-Coated Steel. B. P. Finkbone. *"Engineering Laminates"* (John Wiley & Sons, 1949), p. 403-407.

Manufacture; subsequent fabrication; properties; and applications.

7B-87. Nickel-Clad, Monel-Clad, and Inconel-Clad Steel. W. G. Theisinger. *"Engineering Laminates"* (John Wiley & Sons, 1949), p. 426-452.

Processes of manufacture, subsequent fabrication operations, mechanical properties, design of clad-steel equipment. Data on resistance of Monel, nickel, and Inconel to corrosion by common industrial chemicals. Applications.

7B-88. Stainless Clad Steel. Charles A. Scharschu. *"Engineering Laminates"* (John Wiley & Sons, 1949), p. 453-462.

The various methods (casting, fusion melting, intermelting, and hot rolling); corrosion resistance, mechanical properties, and applications. 111 ref.

7B-89. An Investigation of the Possibilities of Organic Coatings for the Prevention of Premature Corrosion-Fatigue Failures in Steel. Robert C. McMaster. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 628-644; discussion, p. 645-647.

Previously abstracted from advance reprint. See item 7B-53, 1949.

7B-90. Die Phosphatierung als topochemische Reaktion. (Phosphating as a Topochemical Reaction.) A. Wustefeld. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 43-45.

Effect of accelerators, the properties of the phosphate film (surface structure, color, plasticity), its effect on the hardenability of lacquer, and its adsorbing power for lubricants.

7B-91. Hot-Dip Galvanizing; A Practical Technique for Hydrochloric Acid Pickel Control. Thomas B. Crow. *Metallurgia,* v. 39, Apr. 1949, p. 298-302.

Development of a method for control of pickling operations preliminary to galvanizing. The technique, although primarily for the treatment of steel window frames, is generally applicable in the ferrous industry.

7B-92. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, May 1949, p. 36-37.

Defects and practical remedies: pitting; black edge tearing—alligator; rippling; hard and soft bisque; beading along flanges; cracking; scars; and dusting.

7B-93. Influence of Zinc on the Welding and Heat Treating of 18-8 Stainless Steel (Type EYalT). (In Russian.) F. E. Tret'yakov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 12.

Cracks which appeared during heat treatment of welded parts of 18-8, processed in Pb-Zn alloy dies. Cause was found to be related to the presence of Zn from the dies on the surface of the parts. Pickling solution and practice developed for removal of the Zn prior to welding.

7B-94. The Importance of Acid Ratio in Phosphatization of Steel. Nelson F. Murphy and Michael A. Streicher. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 281-289; discussion, p. 289-290.

The function of the above. It is shown that the ratio may be more accurately determined by using bromphenol blue indicator for free-acid titration, and that the pH of the phosphatizing solution is a function of the ratio for the concentrations studied. Factors affected.

7B-95. Palm Oil Substitutes for Hot Dip Tinning. W. R. Johnson, L. C. Kinney, and John M. Parks. *American*

Iron and Steel Institute, Preprint, 1949, 19 pages.

Requirements and tests of tinning oils. Experimental procedure and results.

7B-96. Painting Bicycle Rims. J. Farkas. *Industrial Finishing,* v. 25, May 1949, p. 30-31, 33-34.

Procedures and equipment.

7B-97. Corrosion Protection for Offshore Drilling Structures. Arthur E. Burns, Jr. *Oil and Gas Journal,* v. 48, May 19, 1949, p. 241, 243.

Recommendations for prevention of marine-organism fouling as well as corrosion, by use of various coating materials. Three fundamentally different areas of exposure must be considered: continuously submerged; intermittently submerged; and never submerged.

7B-98. Der Schutzwert von Beizinhibitoren und seine Beurteilung. (The Protective Value of Pickling Inhibitors and Their Evaluation.) I. H. Fischer. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 1-9.

Report on laboratory work on the chemical removal of rust and scale from iron and steel. Results are compared with those of tests made on an industrial scale.

7B-99. Der Schutz des Eisens durch thermisch erzeugte oxydische Bedeckungsschichten (Thermoxydverfahren). [The Protection of Iron by Thermally Produced Oxide Films (Thermo-Oxide Process).] E. Fenner and L. Koch. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 53-56.

Process has the advantage of not requiring any scarce metals, chemicals, and equipment. Its effectiveness is shown by comparative corrosion tests. The oxide film is hard, brittle, and resistant to abrasion.

7B-100. Uber die Wirkung von Schutzstoffen beim Beizen. (The Effect of Inhibitors in Pickling.) K. Wickert. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 137-139.

A method of determining, with 1:1 and 1:4 HCl, the nature of the passivating effect of the inhibitor on the metal surface.. The accelerating effect of NaCl.

7B-101. Prufung des Korrosionsschutzes nichtleitender Lackschichten bei Konservendosen. (Determining the Protective Effect of Nonconducting Lacquer Films on the Corrosion of Tin Cans.) K. Mehnert. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 140-144.

A simple method. Resistance is measured by means of an a.c. bridge and porosity is calculated from the resistance. Typical data are tabulated and charted.

7B-102. The Prevention of Metallic Corrosion. *Machinery Lloyd* (Overseas Edition), v. 21, May 21, 1949, p. 94-97.

Advantages of double and triple treatments for the above, especially those in which phosphate is followed by stain and oil, or by chromate and stain or oil.

7B-103. Abrasive Belts Finish Parts Faster. William F. Stoeffhaas. *American Machinist,* v. 93, June 2, 1949, p. 94-95.

Increased production and lower costs result from use of abrasive belts for grinding and polishing bicycle parts.

7B-104. Machine Scarfing of Steel. O. K. Sharp. *Iron and Steel Engineer,* v. 26, May 1949, p. 53-56; discussion, p. 56-58.

Also known as desurfacing or flame scarfing. Removal of surface defects by means of multiple oxygen-acetylene torches, during some stage of the rolling operation, while the slab, bloom, or billet is still at a rollable temperature. Equipment and procedures.

7B-105. Rust Preventives Help Maintain Steel Structures. J. G. Surchek. *Iron and Steel Engineer,* v. 26, May, 1949, p. 82-85.

Some applications of petroleum-base coatings used by industry for protection of steel structures.

7B-106. Special Phosphate Coating Treatment Ups Output of Cold Drawn Tubing. *Steel,* v. 124, June 6, 1949, p. 118.

7B-107. The Effects of Metallizing Procedures on the Fatigue Properties of Steel. W. Lee Williams. *American Society for Testing Materials,* Preprint 20, 1949, 18 pages.

The four conventional methods of surface roughening, namely, electric bonding, grit blasting, rough threading, and grooving and knurling. The use of shot peening in conjunction with electric bonding. Reasons for reductions in fatigue strength and the way in which these are related to the size of the tested section. 22 ref.

7B-108. How to Clean Ferrous Metal Parts. Rick Mansell. *Machinery,* v. 55, June 1949, p. 194-196.

Use of solvent cleaners, steam-cleaning equipment, phosphoric-acid cleaners, vapor-degreasing equipment, and alkaline cleaners.

7B-109. Body Finishing by Fisher. Ezra A. Blount. *Products Finishing,* v.

13, June 1949, p. 54-56, 58, 60, 62, 64.

Body assembly using spot and torch welding. Metal finishing, rust-proofing, glazing final coating, and polishing operations.

7B-110. A Study of Paints for Enclosed Structural Members in Steel Housing Construction. H. A. Pray and R. S. Peoples. *American Iron and Steel Institute,* Preprint, 1949, 46 pages.

Some 34 kinds of paint systems were studied in contact with such conditions as continuous water immersion, high humidity, continuous condensation, alternate wet-dry conditions, and continuous contact with insulation in the presence of water. 15 ref.

7B-111. Fabrication, Metal Preparation, Enameling—Sinks, Bathtubs and Washing Machine Tubs. Frank Osborne. *Finish,* v. 6, June 1949, p. 19-23, 78.

Plant routine and picture story of sink and bathtub production.

7B-112. Die Entwicklung und Anwendung der Atramentverfahren unter den heutigen Wirtschaftsbedingungen. (Development and Uses of the "Atrament" Processes Under Present-Day Economic Conditions.) F. Rossteutscher. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 66-71.

Various phosphating methods, with emphasis on I.G.'s "Atrament" processes. 17 ref.

7B-113. Uber die Witterungsbeständigkeit von kaltphosphatiertem Stahl. (The Weathering Resistance of Cold-Phosphated Steel.) G. Schikorr. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 82-83.

The effect of cold phosphating and subsequent treatment with oil or oil emulsions on the resistance of steel to sea-water spray and to atmospheric conditions.

7B-114. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. (Pickling, Etching, Pretreating, Rust Removal, and Rust Preventives.) III and VI. (Concluded.) Richard Springer. *Metalloberfläche,* v. 2, Oct. 1948, p. 224-229; v. 3, sec. A, Apr. 1949, p. 96-99.

Two more installments of literature and patent review covering 1935-43.

7B-115. Die Oberflächenrostung, eine neue Vorbehandlung von Eisenoberflächen zum Lackieren. (Surface Oxidation, A New Treatment for Iron Surfaces Prior to Lacquering.) H. Ketterl. *Metalloberfläche,* v. 3, Mar. 1949, p. 72-73.

A new method in which suitable pickling and rinsing, followed by dehydration, will result in production of an oxide that forms an excellent base for lacquer and other protective coatings.

7B-116. Zur Theorie und Praxis des Feuerverzinkens. (The Theory and Practice of Hot Galvanizing.) Heinz Bablik. *Metalloberfläche,* ser. A, v. 3, May 1949, p. 105-110.

The reactions of fluxes in the zinc bath, structures of galvanic deposits, alloying additions to the zinc bath, the Pb-Zn process, and corrosion of hot-galvanized vessels by hog feed.

7B-117. Effects of Acid Treatment on Abrasion and Acid Resistance of Porcelain Enamels. W. N. Harrison, J. C. Richmond, and J. R. Crandall. *Better Enameling,* v. 20, June 1949, p. 18-19.

Recent work at National Bureau of Standards. The most significant finding was that treatment with acetic acid, which produced only minor visible attack, strongly inhibited further attack on subsequent treatment with citric acid, although this acid severely attacked untreated areas of the same specimens.

7B-118. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, June 1949, p. 33.

Defects of porcelain enameling known as beading along flanges, cracking, and black specking.

7B-119. Methods for Prevention of Rust in Water Tanks; A Preliminary Report. Fred Schumann. *Corrosion,* v. 5, June 1949, p. 198-200.

Analyzes corrosion, and discusses electrolytic protection. Proposes a combination of protective coating and electrolytic methods.

7B-120. Protection for Ship Hulls. L. M. Mosher. *Corrosion,* v. 5, June 1949, p. 201.

Surface preparation, initial costs, and use of antifouling paint.

7B-121. Metallizing in Relation to Marine Engineering. J. Barrington Stiles. *Welding Journal,* v. 28, June 1949, p. 541-558.

Equipment used to spray metal, characteristics of the coating, methods of bonding to base material, and techniques for finishing coatings.

7B-122. Electrochemical Studies of Protective Coatings on Metals. Part I. Electrode Potential Measurements on Painted Steel. F. Wormwell and D. M. Brasher. *Journal of the Iron and Steel Institute,* v. 162, June 1949, p. 129-135.

Experimental technique for measuring changes of electrode potential of painted steel immersed in artificial seawater. By continuing observations over longer periods than

previously used, the measurements can be closely correlated with rate of breakdown estimated visually and also by determinations of weight loss. The technique was used to investigate effects of various factors. 15 ref.

7B-123. Continuous Steel Strip Pickling. R. W. Treasure. *Journal of the Iron and Steel Institute,* v. 162, June 1949, p. 201-212.

Principles of construction and operation of the modern continuous-strip pickle line. History of its development, and results of investigation of the removal of mill scale by the use of sulfuric acid. Electrolytic pickling, and the semi-continuous type of pickler and the rotary-coil pickle line. Processing of stainless steel with the aid of caustic soda is dealt with. Constructional and operational aspects of the continuous wide-strip pickle line.

7B-124. The Outlook for Steel. Robert M. Nelson. *Sheet Metal Worker,* v. 40, June 1949, p. 49-50, 82.

Economic trends as well as new developments in manufacture and finishing of sheet steel, with emphasis on the Armco "Zincgrip" process for hot-dip coating.

7B-125. The Studebaker Truck Finish. J. M. Gauss. *Industrial Finishing,* v. 25, May 1949, p. 50-52, 54, 56, 58.

Procedures and equipment for application and baking. (To be continued.)

7B-126. Clad Steel; Manufacture, Treatment and Uses. F. R. Pattison. *Iron and Steel,* v. 22, June 1949, p. 284-288.

Methods for producing homogeneously and nonhomogeneously bonded plates which include casting, intermelting, use of heat and pressure, and welding. Advantages and applications.

7B-127. Hard Surfacing for Increased Wear Resistance. Gilbert P. Muir. *Tool Engineer,* v. 22, June 1949, p. 30-31.

Preparation of part, preheating, hard facing procedure, and application to alloy steels. Characteristics of materials used.

7B-128. Engineered Instrumentation Makes Quality Control of Tin Plate Production Effective. Harry C. Morrow. *Steel,* v. 124, June 20, 1949, p. 120, 123-124, 126, 129.

Methods and equipment for control and recording of different variables.

7B-129. Prufung der Gleichmässigkeit von Zinkuberzugen auf Stahldrähten durch Tauchen in Kupfersulfatlösung. (Determining Uniformity of Zinc Coatings on Steel Wires by Dipping Them Into Copper Sulfate Solutions.) Hubert Hoff and Georg von der Dunk. *Archiv fur das Eisenhuttenwesen,* v. 20, Mar.-Apr. 1949, p. 135-138.

Evaluates the accuracy of the above method, showing that it fails to furnish definite conclusions on the corrosion resistance of the material under natural conditions. 16 ref.

7B-130. New Torch Licks Problem of Flame-Spraying Polythene. W. B. De Long and E. V. Peterson. *Chemical Engineering,* v. 56, June 1949, p. 123-125.

Torch and procedure for application to steel. Corrosion-test results which show that the coatings are nonporous, adherent, and corrosion resistant, in contrast to those applied by other methods.

7B-131. The Studebaker Truck Finish. Part II. J. M. Gauss. *Industrial Finishing,* v. 25, June 1949, p. 32, 37-38.

Surface preparation, painting, and paint-curing operations on automotive hoods, fenders, chassis, and wheels.

7B-132. Modern Instrumentation for Measuring Temperature Gradients in Continuous Porcelain Enameling Furnaces. M. Bozsin and C. A. Vana. *American Ceramic Society Bulletin,* v. 28, June 15, 1949, p. 219-223.

A portable insulated box containing a three-point electronic temperature recorder developed to travel through enameling furnaces heated to 1600° F. Records temperature gradient simultaneously at three levels under normal firing conditions.

7B-133. Mottled Enameled Finishes Obtained by Precipitation of Various Color-Producing Salts. George Sirovy and Edmund P. Czolgos. *American Ceramic Society Bulletin,* v. 28, June 15, 1949, p. 223-224.

Procedure for producing finishes resembling marble, in sheet-steel cover-coat enamels.

7B-134. The Mechanism of Protection by Paints. (In English.) J. E. O. Mayne. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 261-264; discussion, p. 264.

As applied to protection of iron and steel. 14 ref.

7B-135. Préparation des Toles d'Acier par Phosphatation avant Peinture. (Preparation of Steel Sheets for Painting by Phosphating.) Jean Bary. "Premier Congres Technique International de l'Industrie des Peintures et

des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 276-277.

Use of accelerators; the course of the reaction and its mechanism; thickness of the surface layer; optimum conditions of operation; and principal applications.

7B-136. L'Influence de la préparation des surfaces sur la tenue des peintures au brai de houille. (Influence of Surface Treatment on the Adhesion of Coal-Tar-Base Paints.) Albin Marty. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 593-599.

A study of different paints of the above type used for coating of ferrous metals, mostly as protection against corrosion. Thorough investigation indicated that preliminary, careful surface treatment, particularly cold phosphating, greatly improves the adhesion of the paint and increases the duration of effective corrosion resistance.

7B-137. Tank Coatings. (In English.) John C. Moore. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 636-637.

Materials used for protecting the interiors of steel tanks containing petroleum products.

7B-138. Flame Spraying of Metals and Plastics in Engineering and Shipbuilding. F. A. Rivett. *Transactions of the Institution of Engineers & Shipbuilders in Scotland,* v. 92, May 1949, p. 331-342; discussion, p. 342-354.

Development of metal-spraying guns; applications of flame spraying; use of zinc spraying to prevent marine corrosion; spraying of other metals; flame spraying of plastics.

7B-139. Zur Bedeutung des Stickstoffs im Eisen fur die Feuerverzinkung. (The Significance of the Nitrogen Content of Galvanizing Iron.) Heinz Bablik, Franz Götzl, and Rudolf Kukaczka. *Zeitschrift fur Metallkunde,* v. 40, Apr. 1949, p. 141-147.

The effect of nitriding on the adherence and bending strength of galvanized zinc coatings was investigated. Results indicate that nitriding may result in improvement of adherence of the coating. A constitution diagram shows the Fe-N system between 0 and 8% N. Photomicrographs show structures of the deposits, the Zn-Fe bonds and the underlying base metal.

7B-140. Electrolytic Pickling for Galvanizing and Terne Lines. E. A. Matteson. *Products Finishing,* v. 13, July 1949, p. 42, 44, 46.

Procedure used by the Carnegie-Illinois Steel Corp., Gary, Ind.

7B-141. Development of Pipe Line Coatings and Mechanical Application Methods. Stephen D. Day. *Corrosion,* v. 5, July 1949, p. 221-226.

History of the development and successful application of pipe coatings. Coal-tar enamels, asphalts, petroleum compounds, and application methods.

7B-142. Chemical Rust Remover; German Development of a Non-Destructive Process. *Chemical Age,* v. 60, June 18, 1949, p. 890.

Three separate methods: dipping articles, application of a paste, and a method for larger surfaces which converts rust into a protective covering.

7B-143. Nickel Dip Practice and Control for Porcelain Enameling. Norman H. Stolte. *Finish,* v. 6, July 1949, p. 24, 46, 48.

Recommended procedures on the basis of a brief literature review. Includes methods for determination of nickel coatings on enameling iron.

7B-144. Continuous Coating. Forrest M. Morrow and K. Oganowski. "Yearbook of the American Iron and Steel Institute, 1948", p. 577-594; discussion, p. 594-601.

Previously abstracted from *Industrial Heating,* item 7b-158, 1948.

7B-145. Continuous Strip Pickling. E. D. Martin. "Yearbook of the American Iron and Steel Institute, 1948", p. 602-654; discussion, p. 654-666.

Previously abstracted from *American Iron and Steel Institute,* preprint, item 7B-116, 1948.

7B-146. Elektrometallisering med zink —exempel pa sprutförzinkning av stora järnkonstruktioner. (Electrogalvanizing—An Example of Spray-Zinc Coating of Large Iron Structures.) Bo Löfgren. *Finish* (Sweden), v. 6, Mar. 1949, p. 49-51.

A method of protecting steel ship hulls, etc., from corrosion.

7B-147. Die Auswirkung von Titan im Eisen beim Feuerverzinken. (The Effect of Titanium in Iron on Hot-Galvanizing.) Heinz Bablik, Franz Götzl, and Rudolf Kubaczka. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 176-179.

The differential effects of Si and Ti in Fe on the Fe-Zn reaction. About 0.7% Si in Fe multiplies the reaction about 10 times, while Ti fails to increase its rate. Other effects of Ti in Fe.

7B-148. How Kelvinator Refrigerators Are Enameled White. John C. Pietrzyk. *Industrial Finishing,* v. 25, July 1949, p. 22-24, 26, 28.

Cleaning, rustproofing, etching, coating, and baking procedures.

7B-149. Metallizing in Relation to Marine Engineering. *Welding Journal,* v. 28, July 1949, p. 659-669.

Extensive discussion of paper by J. Barrington Stiles (June issue). Author's replies to the various comments.

7B-150. Metallizing: How They Put It to Work in Chemical Plants. J. E. Wakefield. *Chemical Engineering,* v. 56, July 1949, p. 96-97.

Surfacing cast iron rolls with stainless, tin-coating alcohol tanks, and restoring plug cocks.

7B-151. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, July 1949, p. 16-17.

Defects known as "poppers"; eggshell, mat, or pimply appearance; and orange peel. Remedies.

7B-152. Body Finishing; "Rotodip" and "Rotospray" Plants at Morris Motors Ltd., Cowley. *Automobile Engineer,* v. 39, July 1949, p. 271-272.

7B-153. Production Drying of Finishes Accomplished With Infra-Red Ovens. J. A. Martin. *Materials & Methods,* v. 30, July 1949, p. 68-70.

7B-154. Rustproofing and Painting Morris Bodies. *Machinery* (London), v. 75, July 14, 1949, p. 54-56.

Finishing line for British car.

7B-155. High Speed Buffing. A. H. Allen. *Steel,* v. 125, July 18, 1949, p. 89-90.

Special unit which processes 73,000 screw heads per hour. The buffing is an essential preliminary to a plating operation.

7B-156. Continuous Galvanizing of Strip Steel. H. W. Lynn. *Iron Age,* v. 164, July 21, 1949, p. 96-100.

Advantages of Zn coating strip steel by a continuous operation. Preliminary operations on a Weirton installation.

7B-157. Paint for Oil Duct Systems for Steam Turbines. (In Russian.) E. V. Iskra and V. I. Volkov. *Kotloturbostroenie* (Boiler and Turbine Manufacture), Mar.-Apr. 1949, p. 30-32.

Different paints and lacquers were investigated. Method of testing. Best paint for exposure to oil-containing moisture. Chemical and physical properties of this paint. 20 ref.

7B-158. Formation of Residual Stresses During Polishing of High-Chromium Stainless Steel. (In Russian.) L. A. Glikman, T. P. Sanfirova, and V. A. Stepanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 441-447.

Experimental investigation showed that stresses formed during polishing have a thermal origin which may be influenced by volumetric variation related, probably, to phase transformations, in certain cases. Similar phenomena occurred during polishing of a stainless-steel plate for which the diagram of residual stresses differed essentially from the usual diagram.

7B-159. Clad Steel. F. R. Pattison. *Journal of the Birmingham Metallurgical Society,* v. 29, June 1949, p. 86-102; discussion p. 103-110.

Previously abstracted from *Iron and Steel,* item 7B-126, 1949.

7B-160. Drawing Compounds and Other Variables in the Rinsing of Metal Cleaners. Louis A. Pavlish. *Enamelist,* v. 26, Summer 1949, p. 3-7.

The rinsing process between the cleaning of steel and its immersion into the H_2SO_4 pickle has been given little consideration in the preparation of steel for porcelain enameling. A modification of the regular pickling procedure was used to determine the effects of various rinsing variables: addition of drawing compound to cleaner; carry-over of cleaner to rinse; flanged parts; transfer time between cleaner and rinse; and temperature of rinse.

7B-161. Finishing Trailers in Zinc. *Organic Finishing,* v. 10, July 1949, p. 19-20.

Application of "zincilate", a self-protecting Zn coating applied to scale-free metal surfaces by brush, spray gun, or dipping.

7B-162. New Exterior Paints for H. M. Ships. *Paint Manufacture,* v. 19, July 1949, p. 236-238.

Work done in applying modern synthetic-resin paints to ships of the British Navy.

7B-163. Protective Coatings. G. E. Seidel. *Steel Processing,* v. 35, July 1949, p. 368-370.

Procedures for surface preparation and application of the coatings for steel structures exposed to water, alkali, salt, and petroleum.

7B-164. Protective Coating Prevents Slag on Boiler Heating Surfaces. E. F. Walsh. *Power Generation,* v. 53, July 1949, p. 74-75.

Internal surfaces exposed to gas are cleaned and then coated with lime slurry. Principles and results of treatment on several boilers.

7B-165. Production of Hot and Cold-Rolled Strip and Sheets. Parts VII and VIII. Charles L. McGranahan. *Steel,* v. 125, July 18, 1949, p. 91-92, 94, 96, 98, 101; July 25, 1949, p. 80, 82, 84, 87-88, 90.

Part VII deals with hot-dip and electrolytic galvanizing and surface-preparation procedures and equipment. Satisfactory coating thicknesses for various uses. The final section discusses electrolytic galvanizing lines, formed steel products including corrugated roofing and siding, and methods used for the hot rolling and finishing of stainless and heat resistant steel sheets and strip.

7B-166. Thin Stampings Deburred Without Bending. *Steel,* v. 125, July 25, 1949, p. 75.

A "self" tumbling process for soft steel stampings which uses the abrasive action of the pieces rubbing on each other, plus a small amount of fine abrasive.

7B-167. Steel in "Glass" Clothing. *Esso Oilways,* v. 16, Aug. 1949, p. 14-20.

Methods used to make a variety of products including porcelain-coated-steel wall covering.

7B-168. This Plant is Built to Design, Fabricate and Finish Sheet Steel Signs. H. H. Wineburgh and J. E. Bourland. *Finish,* v. 6, Aug. 1949, p. 19-22, 66, 68.

Plant, equipment and procedures.

7B-169. How to Prevent Defects in Porcelain Enameling Holloware. Part X. Ground Coat Defects. F. A. Petersen. *Ceramic Industry,* v. 53, Aug. 1949, p. 61, 84, 86.

Recommendations applicable to adherence, fishscale, copperheads, and burnoff.

7B-170. Production of Tin Plate. Alfred E. Kadell. *Steel,* v. 125, Aug. 1, 1949, p. 82-84, 86, 88; Aug. 8, 1949, p. 84, 86, 89-90, 92; Aug. 15, 1949, p. 114, 116, 118, 121-122, 124.

The two processes in commercial use for the above (hot-dip and electrolytic tinning), including preliminary and succeeding operations. Part I describes precleaning procedures, coiling, annealing, and temper rolling. Part II takes up the next operation—tinning itself—and describes the hot-dip method. Also covers following operations, including inspection and packing. Part III describes the alkaline and the acid processes, both in current use for electrodepositing tin on steel sheets.

7B-171. Cleaning and Finishing of Ilg Fan Parts. *Industrial Heating,* v. 16, Aug. 1949, p. 1428, 1430, 1432.

Improved conveyor-belt system of cleaning, drying, painting, finishing, and assembly of cooling fans.

7B-172. Pickling Acid Measurement and Control. D. H. Krouse. *Blast Furnace and Steel Plant,* v. 37, Aug. 1949, p. 961-964.

Use of "Flowrator", a rotameter type of flow meter in which a float moves vertically in a tapered tube in direct response to changes in rate of flow.

7B-173. The Hudson Finish. *Industrial Finishing,* v. 25, Aug. 1949, p. 14-16, 18, 20, 23.

Processes involved in finishing Hudson bodies.

7B-174. Cleaning and Painting Used Steel Drums. William J. Miskella. *Industrial Finishing,* v. 25, Aug. 1949, p. 58-60, 62, 66, 68.

Mass production setup for cleaning and inspecting insides and outsides of drums and for spray painting and baking outside coatings.

7B-175. Pickling Combined With Galvanizing in Continuous Coil Galvanizing Line. *Steel,* v. 126, Aug. 22, 1949, p. 81.

For coating hot roll strip of 12, 16, and 18 gage.

7B-176. Metal-Spraying Plant for Rolled-Steel Sections. *Engineering,* v. 168, Aug. 5, 1949, p. 127, 132.

British equipment for spraying a protective Al coating, 0.004 in. thick, on the surfaces of certain steel joists and other sections required for structural steelwork.

7B-177. The Role of Blast Cleaning Apparatus in Bonding Rubber to Metal. J. F. Farrell. *Rubber Age,* v. 65, Aug. 1949, p. 549-551.

Equipment and procedures.

7B-178. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Aug. 1949, p. 36.

Porcelain-enamel defect known as tearing; causes and remedies.

7B-179. The Protective Action of Sprayed Aluminium Coatings on Steel. G. Tolley. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 377-384.

The galvanic behavior of steel plus sprayed Al was investigated in various solutions during one week's immersion. The corrosion processes affecting changes in electrode potential during immersion in relation to observed early rust-staining of sprayed Al coatings on steel. The effect of $Al_2(SO_4)_3$ on the corrosion of steel. 19 ref.

7B-180. Some Applications of Continuous Hot-Dip Galvanising. Heinz Bablik. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1657-1660.

Wire, tube, strip, and other applications. Schematic diagrams of machinery.

7B-181. Der Kohlenstoff als Fehlerquelle beim Emaillieren. (Carbon as a Source of Defects in Enameling.) Werner Engelhardt. *Metalloberflache,* v. 3, sec. A, July 1949, p. A141-A145.

Among the causes of defective enameling are formation of CO and CO_2 and release of atomic hydrogen from the steel. Means of preventing such defects. 14 ref.

7B-182. Die Kinetik der Bedeckungserscheinungen, insbesondere die des Phosphatierungsvorganges. (The Kinetics of Coating Phenomena, Especially That of the Phosphating Process.) W. Machu. *Archiv für Metallkunde,* v. 3, June 1949, p. 203-208.

Develops a general rule for the rate of reaction in the formation of protective metal coatings. The rate of film formation at the cathode is proportional to the area of the anode. Application of the rule to 11 specific examples. 11 ref.

7B-183. Palm Oil Substitutes for Hot Dip Tinning. W. R. Johnson, L. C. Kinney, and John M. Parks. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 99-102. A condensation.

Previously abstracted from *American Iron and Steel Institute,* Preprint. See item 7B-95, 1949.

7B-184. Removing Mill Scale from Steel. Rick Mansell. *Organic Finishing,* v. 10, Aug. 1949, p. 20-21.

Several methods currently used. Suggested procedures.

7B-185. Protective Coatings for Steel (Cementation Processes). Jerome L. Bleiweis. *American Machinist,* v. 93, Sept. 8, 1949, p. 143.

Purpose, nature of coating, treatment, procedure, notes, and comments in outline form for calorizing and sherardizing.

7B-186. Observations on the Reactions of Red Lead. Manfred Ragg. *Paint, Oil and Chemical Review,* v. 112, Sept. 1, 1949, p. 28, 30.

With special reference to the mechanism of the rust-inhibitive action of red-lead paints on iron and steel.

7B-187. Traitement superficiel de la fonte malléable. (Surface Treatment of Malleable Cast Iron.) Pierre Tyvaert. *Fonderie,* June 1949, p. 1626-1627.

A new method of chemical tin coating of malleable iron, developed on a laboratory scale. Possibility of application on an industrial scale.

7B-188. Flussstahlemaillierung im chemischen Apparatebau. (Enameling Cast Steel Used for Chemical Apparatus.) Karl Frick. *Chemie-Ingenieur-Technik,* v. 21, July 1949, p. 249-258.

Methods and equipment. Testing the enameled parts for porosity, thermal, and chemical properties. Possible methods of repair.

7B-189. Adsorption und Absorption von Oberflächenschichten, insbesondere von Phosphatoberflächenschichten, und deren Plastizität. (Adsorption and Absorption of Surface Films, Especially Phosphatic Films, and Their Plasticity.) H. Wüstefeld. *Archiv für Metallkunde,* v. 3, June 1949, p. 223-224.

The physicochemical principles of bonderizing. The properties of a given phosphate film depend to a large extent on the conditions of formation. Tests demonstrate the adsorption of soap by the phosphate film and the deposition of films on clean uncoated and on bonderized metal surfaces.

7B-190. Beizen, Atzen, Vorbehandeln, Entrosten und Rostschutzmittel. (Pickling, Etching, Pretreating, Rust Removal, and Rust Preventives.) IV. Richard Springer. *Metalloberflache,* v. 2, Dec. 1948, p. 271-275.

Literature and patent references for the years 1935-1943. Pickling in the enameling industry, pickling and pickling apparatus, and regeneration of spent pickling baths. For other installments see items 7B-25, 7B-61, and 7B-114, 1949.

7B-191. Finishing the Lustron Home. Part III. Ezra A. Blount. *Products Finishing,* v. 13, Sept. 1949, p. 14-20, 22.

How cabinet parts for the Lustron Home are finished.

7B-192. Zur Kurzprüfung von Konservendosenlacken. (Short-Time Testing of "Tin" Can Lacquers.) H. Niesen. *Archiv für Metallkunde,* v. 2, no. 7, 1948, p. 237-248.

Experiments to test the mechanical and chemical properties of three different lacquers on blank and bonderized sheet metal. Corrosion resistance was determined in distilled water, 2% salt solution, and 2% salt plus 2% acetic acid solution. The bonderized sheets proved to be chemically more resistant than the blank sheets. 10 ref.

7B-193. Das Inkromverfahren. (The "Inkrom" Process.) F. Steinberg. *Archiv für Metallkunde,* v. 2, no. 8, 1948, p. 253-254.

A chromizing process for converting the surfaces of ordinary steel parts into high-test, rust resistant steel.

7B-194. Rostschutz von Isolatorenkappen aus Temperguss. (Rust-Preventive Coatings for Malleable Iron Insulator Caps.) F. Roll. *Archiv für Metallkunde,* v. 2, no. 8, 1948, p. 254-256.

Results obtained over a period of years with metallic and nonmetallic coatings. Concludes that hot-dip zinc coatings are superior.

7B-195. Über die Erhöhung der Haftfestigkeit von Einbrennlackschichten auf Bandstahl und Feinblechen. (Increasing the Adhesiveness of Baked Lacquer Coatings on Strip Steel and Thin Sheets.) F. Eisenstecken. *Archiv für Metallkunde,* v. 2, no. 8, 1948, p. 256-258.

Effects of cleaning and pretreatment of the metal surface on the adhesiveness of lacquer coatings and their behavior.

7B-196. Über die Nachbehandlung von Phosphatschichten mit Chromaten. (Subsequent Treatment of Phosphate Coatings with Chromates.) W. Machu. *Archiv für Metallkunde,* v. 3, July 1949, p. 250-253.

The porosity of phosphate films is reduced by treating with $NaCrO_4$, $K_2Cr_2O_7$, or CrO_3. Chromate-treated phosphate coatings have an increased electrical resistance not only because of their reduced porosity, but also because of the passivating effect of the chromate in the pores of the protective film.

7B-197. Production Painting of Metal for Power Shovel Cabs. Walter Rudolph. *Industrial Finishing,* v. 25, Sept. 1949, p. 37-38, 40, 42.

Methods and equipment used in a comparatively small paint shop by which all sheet-metal panels and various other parts are cleaned by hand, spray painted, and then moved through an infrared baking oven.

7B-198. Phosphate Processes for Iron and Steel With Special Reference to Rust-Proofing. E. E. Halls. *Metallurgia,* v. 40, July 1949, p. 159-163; Aug. 1949, p. 193-199.

Phosphate treatments developed for wear resistance where metal-to-metal contact is involved in the functioning of a mechanism. In some instances sheet or strip is phosphated to assist drawing operations in pressing and to reduce wear on tools. Phosphated sheet as a substitute for tin plate. Test results.

7B-199. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Sept. 1949, p. 17-19.

Photomicrographic cross sections of enameling defect known as blistering. Causes and remedies.

7B-200. 3 Generations of Quality Products. That's the Story of Crown Stove Works. *Better Enameling,* v. 20, Sept. 1949, p. 8-15.

Miscellaneous procedures and equipment, with emphasis on enameling and forming.

7B-201. An Investigation of Structural Steel Shop Coat Priming Paint. S. C. Frye. *Corrosion,* v. 5, Sept. 1949, p. 288-291.

Test results for 17 paints using three types of pigmentation on structural steel in different conditions: as received from the mill, pickled in inhibited acid, and after different degrees of rusting followed by scale removal.

7B-202. The Practical Problems of Corrosion. Part XIII. The Painting of Wet Steel Surfaces. J. E. O. Mayne and U. R. Evans. *Journal of the Society of Chemical Industry,* v. 68, July 1949, p. 212-215.

Several types of paints were applied to wet hot rolled mild steel in various conditions. No difference between these specimens and those painted while dry could be detected after 8 years outdoor exposure. The evidence is not believed sufficient to justify disregarding the usual recommendations against painting wet surfaces.

7B-203. Lowering Costs by Prefinishing Bumper Bars. *Automotive Industries,* v. 101, Sept. 15, 1949, p. 35.

New method of polishing the steel in the flat with abrasive belts. Limited to the cold formed type of bumper bar.

7B-204. Rotodip and Rotospray at Morris Cowley. *Electroplating and Metal Finishing,* v. 2, Aug. 1949, p. 533-539.

British plant for mechanized cleaning, phosphating, and primer painting motor-car bodies including associated sheet metal components. (To be continued.)

7B-205. Automatic Spray Finishing Saves Manpower and Materials. *Steel,* v. 125, Sept. 26, 1949, p. 98, 100.

A completely conveyerized operation in which both flanged and pie-shaped bolted tank plates for fuel-oil storage tanks are washed, painted, and baked at high speed. Electrostatic paint spraying is used for both primer and finished coats.

7B-206. Prefinishing of Steel for Plating or Enamelling Cuts Production Costs. Kenneth Rose. *Materials & Methods,* v. 30, Oct. 1949, p. 67-69.

Shows that buffing and polishing steel in the flat and protecting the

surface during forming with a special coating saves money in preparing irregular shapes for final finishing.

7B-207. A Modern Finishing Plant for Electric Ranges. E. F. Shart and D. M. Root. *Finish,* v. 6, Oct. 1949, p. H39-H43, H54.

Completely conveyerized department for cleaning and finishing Hotpoint range parts.

7B-208. Practical Applications of Modern Products. *Products Finishing,* v. 14, Oct. 1949, p. 78-80, 82, 84.

Flexible automatic polishing and buffing machines which speed automotive trim finishing; electric hoist equipment which speeds finishing of air brake hose clamps; and phosphatizing treatment for transformer radiators.

7B-209. A Study of Shop Coat Structural Steel Paint Primer. S. C. Frye and G. Diehlman. *American Railway Engineering Association, Bulletin,* v. 51, Sept.-Oct. 1949, p. 87-103.

See abstract from *Corrosion,* item 7B-201, 1949.

7B-210. Salt-Bath Chromizing. I. E. Campbell, V. D. Barth, R. F. Hoeckelman, and B. W. Gonser. *Journal of the Electrochemical Society,* v. 96, Oct. 1949, p. 262-273.

See abstract of condensed version from *Iron Age,* item 18B-95, 1949.

7B-211. Application and Firing of Low Temperature Enamels. P. M. Wheeler and O. R. Novy. *Better Enameling,* v. 20, Oct. 1949, p. 6-8, 22-23.

Low-temperature enamels are defined as those which mature at 1250-1350° F. Advantages of these enamels and changes in techniques required.

7B-212. Grit Blasting Sheet Steel Parts for Porcelain Enameling. A. E. Raeuber and E. C. Ploetz. *Better Enameling,* v. 20, Oct. 1949, p. 14-15, 27.

Advantages, as compared with sand blasting. Experimental results obtained with low-carbon steel grit.

7B-213. The Operation and Maintenance of Spray Pickling Equipment. H. C. Ellinger. *Better Enameling,* v. 20, Oct. 1949, p. 17-18, 27.

Various solutions involved, as well as the equipment used.

7B-214. Emulsion and Alkaline Cleaning. A. J. Holloway. *Better Enameling,* v. 20, Oct. 1949, p. 19, 30.

Experimental work as applied to steel preparatory to porcelain enameling.

7B-215. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Oct. 1949, p. 36-37.

Causes and remedies for the following porcelain enamel defects: black specks, greasy appearance, shorelines, and black hairlines.

7B-216. Continuous Galvanizing—A Development Program. A. H. Ward. *Iron Age,* v. 164, Oct. 13, 1949, p. 74-79, 154.

Production-line galvanizing of heavy-gage sheets in coils weighing up to 50,000 lb. was made possible only after extensive research. Results obtained in the preliminary investigation and various fundamental factors, including coating adherences and base-metal properties, as related to conventional and continuous galvanizing.

7B-217. Satin Finishing Stainless Products. Fred Littlejohn. *Steel,* v. 125, Oct. 17, 1949, p. 81-82.

Use of coated abrasive-belt polishing machines or special brush-backed finishing tools to achieve various architectural and decorative effects.

7B-218. Über den Einfluss saurer und neutraler Phosphatlosungen auf Flussstahl. (The Effect of Acid and Neutral Phosphate Solutions on Ingot Steel.) G. Seelmeyer. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 289-294.

The corrosive effects of phosphates added to the water in hot water heating plants was investigated to determine whether the phosphate ion alone or only in conjunction with other ions has a passivating effect. Potentials, measured and correlated with phosphate concentration and time, indicate that neither phosphate ions alone nor $FePO_4$ films at pH values of 8.8 have a sufficient passivating effect to account for the corrosion-inhibitive effect. 11 ref.

7B-219. Paints for Enclosed Structural Members in Steel Housing Construction. H. A. Pray and R. S. Peoples. *Iron Age,* v. 164, Oct. 20, 1949, p. 63-70.

See abstract of *American Iron and Steel Institute, Preprint,* 1949, item 7B-110, 1949.

7B-220. Phosphate Treating of Transformer Radiators at Allis-Chalmers Plant. *Industrial Heating,* v. 16, Oct. 1949, p. 1836.

7B-221. Cleaning and Phosphating Tractor Parts in One Operation. L. Williams. *Iron Age,* v. 164, Oct. 27, 1949, p. 66-68.

One-stage operation in which tractor parts are cleaned and phosphate coated.

7B-222. Chromizing Process as Developed and Used by Diffusion Alloys, Limited, of London. Charles A. Naugle. *Technical Data Digest,* v. 14, Nov. 1, 1949, p. 13-19.

Procedure, equipment, and results. Concludes that the process is commercially feasible and superior to the German process. Two other diffusion processes developed by the same company: "Sichromal" for simultaneous diffusion of Si, Cr, and Al into steel surfaces; and the "Hypoeutectoid" controlled carburizing process.

7B-223. Automatic Finishing of Water Heaters. Gilbert C. Close. *Industrial Finishing,* v. 25, Oct. 1949, p. 12-14, 17-18, 21-22.

Procedures and equipment.

7B-224. Abrasive Blasting Prepares Pipe Surfaces for Coating. J. F. Farrell. *Petroleum Engineer,* v. 21, Oct. 1949, p. D34-D36.

Methods and equipment.

7B-225. Handling Emery Dust in Saw Glazing. Clyde S. Cassels. *Iron Age,* v. 164, Nov. 3, 1949, p. 94-95.

Equipment and procedures for emery polishing of saw blades and for handling the dust.

7B-226. Operation and Maintenance of Spray Pickling Equipment. H. C. Ellinger. *Finish,* v. 6, Nov. 1949, p. 27-28, 70.

Operating data and practical suggestions based on three years of operation.

7B-227. Grit Blasting Sheet Steel Parts. A. E. Raeuber and E. D. Ploetz. *Finish,* v. 6, Nov. 1949, p. 25-26, 39.

See abstract from *Better Enameling,* item 7B-212, 1949.

7B-228. Review of Titanium Enamel Development and Its General Properties. Donald R. Goetchius. *Enamelist,* v. 26, Fall 1949, p. 3-6.

17 references.

7B-229. Effective Use of Vinyl Coatings in Control of Oil Tank Corrosion. W. J. Clayton. *Pipe Line News,* v. 21, Nov. 1949, p. 36-37.

Effects of plasticizer type and relationship of tide-range tests to sour-crude tank protection.

7B-230. A Study of Primers for Ferrous Metals in an Atmospheric Exposure. Fifth Report. *American Paint Journal* (Convention Daily), v. 34, Nov. 3, 1949, p. 14-16, 18-20, 25-28; **Atmospheric Exposure of Primers for Ferrous Surfaces.** *Paint, Oil and Chemical Review,* v. 112, Nov. 10, 1949, p. 96-104.

Tables give results of 1⅓, 1⅚, and 2⅓ yrs. Massachusetts outdoor exposure of a long series of primer compositions and systems.

7B-231. Variety, Volume, Versatility Characterize the Porcelain Enameling Operations at Independence Stove & Furnace Co. *Better Enameling,* v. 20, Nov. 1949, p. 8-15.

7B-232. Trouble Shootin'. John L. McLaughlin. *Better Enameling,* v. 20, Nov. 1949, p. 16.

Causes and remedies for porcelain-enamel defects known as pitty or dimpling, and waterline.

7B-233. Wrinkle Finish for Ingersoll Steel Furnaces. Adrian Heystek. *Industrial Finishing,* v. 26, Nov. 1949, p. 18-20, 22.

Application procedures and equipment.

7B-234. Continuous Strand Cleaning and Coating of High Carbon Rods and Wire. David L. Doty. *Wire and Wire Products,* v. 24, Nov. 1949, p. 1034-1038, 1065-1067.

Potential advantages and commercial status of continuous strand cleaning and coating of rods and wire in tandem with the patenting operation. The process is largely in the experimental stages and results obtained to date are not considered conclusive.

7B-235. Dip Finishing Component Parts. *Organic Finishing,* v. 10, Nov. 1949, p. 14-16.

Procedures and equipment for finishing bicycle frames and fenders.

7B-236. Continuous Pickling; Descaling Steel Strip for Hot-Rolled Coils. John H. Mort. *Iron and Steel,* v. 22, Nov. 1949, p. 479-485.

Procedures and equipment, including calculations, bath compositions, acid consumption, etc. Calculations are facilitated by nomographs and clarified by numerical examples.

7B-237. Furnace Atmospheres in Vitreous Enamelling. S. E. A. Ryder and G. W. Culshaw. *Foundry Trade Journal,* v. 87, Nov. 3, 1949, p. 551-555; discussion, p. 555-556; *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2401-2404, 2406.

Effects of SO_2 and SO_3 in various concentrations and ratios on quality of enamels made from an acid resisting Ti frit, a high-opacity Zr frit, and an Sb frit.

7B-238. How Pontiac Prefinishes Bumper Bars. *Automotive Industries,* v. 101, Nov. 15, 1949, p. 38-39.

Microfinishing operation.

7B-239. Palm Oil Substitutes for Hot Dip Tinning. W. R. Johnson, L. C. Kinney, and John M. Parks. *Yearbook of the American Iron and Steel Institute,* 1949, p. 405-514; discussion, p. 515-526.

Previously abstracted from preprint. See item 7B-95, 1949.

7B-240. A Study of Paints for Enclosed Structural Members in Steel Housing Construction. H. A. Pray and R. S.

Peoples. *Yearbook of the American Iron and Steel Institute,* 1949, p. 527-572; discussion, p. 572-577.

Previously abstracted from preprint. See item 7B-110, 1949.

7B-241. The Behavior of Bituminous Pipe Coatings Under Bending Vibrational Stress. W. Beck. *Corrosion,* v. 5, Dec. 1949, p. 405-408.

Reinforced and nonreinforced asphalt coatings and a wrapping impregnated with petroleum grease were applied to the surface of a steel pipe and exposed to the influence of bending vibrational stresses. With the exception of the grease bandage, all layer systems, when submitted to simultaneous action of low temperature and oscillation, showed brittle fracture and fatigue. Crack formation was followed by measurements of electric resistance and corrosion observations. Results indicate the possibility that low temperatures and vibration from heavy traffic will adversely affect the life of certain bituminous coatings on underground pipe lines.

7B-242. Power Driven Brushes Remove Mill Scale From Steel Shapes. *Steel,* v. 125, Dec. 5, 1949, p. 121.

7B-243. Descaling Wire; New Process Described. *Wire Industry,* v. 16, Nov. 1949, p. 905-906.

New proprietary process, using a chemical solution known as "Jenolite". It is used for both rust removal and rustproofing.

7B-244. Pickling Sheet Steel Prior to Finish Application. T. F. O'Brien. *Finish,* v. 6, Dec. 1949, p. 39-40, 64-65.

General procedures, types of pickling acids, mechanism of pickling, recommended pickling compositions, and smooth vs. etched metal surfaces.

7B-245. The Engineering Implications and Economics of Surface Preparation of Mild Steel Prior to Fabrication. W. A. Johnson. *Engineer,* v. 188, Nov. 18, 1949, p. 589-591. A condensation.

Various methods of surface preparation and prevention of corrosion by means of coatings. Advantages of sprayed aluminum.

7B-246. Cleaning Ferrous Metal Parts. R. Mansell. *Machinery* (London), v. 75, Nov. 17, 1949, p. 717-718.

Use of solvent cleaners, steam-cleaning equipment, phosphoric-acid cleaners for rust removal, and vapor degreasing and alkaline cleaning.

7B-247. Durch die Formgebung der Rohware bedingte Emailfehler. (Enameling Defects Due to Forming of the Metal Prior to Enameling.) Hans J. Karmaus. *Metalloberfläche,* v. 3, Oct. 1949, p. A186-A191.

Causes and preventive measures.

7B-248. Der heutige Stand des Beizens und des Feuerverzinkens. (The Present Status of Pickling and Hot-Galvanizing.) Rolf Haarmann. *Stahl und Eisen,* v. 69, Oct. 13, 1949, p. 734-739.

Reviews literature and shows that, in the Fe-Zn reaction, several factors need be considered. Even small amounts of Al retard this reaction. Small amounts of Cu in the Zn bath have no appreciable effect; but Cd is an undesirable element. The importance of C and Si content in the steel is emphasized, also the effect of surface treatment on the adhesiveness of the zinc plating. 48 ref.

7B-249. Pickling Sheet Steel Prior to Porcelain Enameling. T. F. O'Brien. *Better Enameling,* v. 20, Dec. 1949, p. 6-7, 18-19, 34.

General discussion and practical recommendations.

7B-250. Linings for Steel Shipping Containers. L. F. McKay. *Chemical and Engineering News,* v. 27, Dec. 12, 1949, p. 3694-3697.

Research program sponsored by Steel Shipping Container Institute at Battelle Memorial Institute. Effect of surface conditions on coatings performance was investigated by automatically spraying measured thicknesses of representative and widely used commercial coatings onto the various surfaces and then placing the coatings in contact with corrosive chemicals in test coils.

7C—Nonferrous

7C-1. Vapour Blast; Applications in the Non-Ferrous Metal Industry. *Metal Industry,* v. 73, Dec. 10, 1948, p. 471-472.

7C-2. Patinising Zinc. Hanns Benninghoff. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 782-783.

A chemical-solution method of producing a true patina on zinc surfaces without use of electroplating, recently developed in Germany.

7C-3. High-Temperature Ceramic Coatings for Molybdenum. *Ceramic Age,* v. 52, Dec. 1948, p. 312-313.

See abstract of paper by D. G. Moore, L. H. Bolz, and W. N. Harrison. *National Advisory Committee for Aeronautics, Technical Note,* item 7C-30.

7C-4. High-Temperature Ceramic Coatings for Molybdenum; Bureau Tests Point to Successful Results. *Enamelist,*

v. 25, Dec. 1948, p. 50-51, 53-54. (Based on paper by D. G. Moore, L. H. Bolz, and W. N. Harrison.)

Previously listed from *National Advisory Committee for Aeronautics,* Technical Note No. 1626, (See item 7C-30, 1948.)

7C-5. Decorative Finishes for Lead. Kempton H. Roll. *Metal Finishing,* v. 47, Jan. 1949, p. 64-67.

Chemical, painting, and plating methods, including surface preparation.

7C-6. High-Temperature Ceramic Coatings Developed for Molybdenum. *Steel,* v. 124, Jan. 24, 1949, p. 59, 82.

Recent development of National Bureau of Standards.

7C-7. Wood Grain, Leather and Other Textures Via Transfer Films. *Die Castings,* v. 7, Feb. 1949, p. 46-48, 50.

Method for application of the above to the curved surfaces of die castings.

7C-8. (Book). **Jeweler's Workshop Practices.** Leslie L. Linick. 500 pages. Henry Paulson & Co., 131 Wabash Ave., Chicago 3, Ill.

Practical information, including short cuts, formulas, shop kinks, and former trade secrets. Coloring and plating methods; cleaning, polishing, burnishing, and preserving methods. Information on the buying and testing of old gold articles.

7C-9. The Chemical Colouring of Metals: Some Reactions Involving the Slow Liberation of Sulphur, Selenium and Tellurium. M.C.N. Hold and A. M. Ward. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 33-39. (Preprint.)

Changes in color of surfaces when metals are immersed in solutions of sodium thiosulfate and lead acetate.

7C-10. Adhesion of Polythene to Metal. C. E. Richards and R. L. Bull. *Journal of the Society of Chemical Industry,* v. 68, Jan. 1949, p. 19-22.

Two methods of coating metals with polythene: use of polyisobutylene soaked in a polymerizable compound which is subsequently polymerized *in situ;* and use of molten polythene on a previously prepared lead surface.

7C-11. The Marriage of Silver to Glass; The Scientific Side of Mirror Making. Ambrose R. Nichols, Jr. *Glass Digest,* v. 28, Feb. 1949, p. 10-11, 42-46.

An elementary presentation of fundamental principles involved.

7C-12. Deposition of Pure Boron. II. A Flow Method for the Deposition of Boron on Wires. H. I. Schlesinger George W. Schaeffer, Glen D. Barbaras, and Thomas Wartik. *U. S. Atomic Energy Commission,* MDDC-1339, Aug. 15, 1944, 16 pages.

Apparatus and method for deposition of boron released by thermal decomposition of diborane. Applications in neutron thermometers and high-temperature coefficient resistors.

7C-13. Chemical Colouring; Reactions Involving Liberation of Sulphur, Selenium and Tellurium. M. C. N. Holt and A. M. Ward. *Metal Industry,* v. 74, Mar. 11, 1949, p. 186-188.

Changes in color of metal surfaces when immersed in sodium thiosulfate and lead acetate solutions. Various acids were tried, the initial experiments being made with brass. A range of colors was also produced on copper, type metal, and silver.

7C-14. Vitreous Enameling of Aluminium and Aluminium Alloys—A Critical Study. J. C. Bailey and Marjorie E. Whitaker. *Light Metals,* v. 12, Mar. 1949, p. 139-154; commercial appraisal, p. 154-159.

Reviews knowledge and practices; properties and test results.

7C-15. The Influence of Crystal Face in the Catalytic Deposition of Cobalt on a Single Crystal of Copper. Henry Leidheiser, Jr., and Richard Meelheim. *Journal of the American Chemical Society,* v. 71, Mar. 1949, p. 1122-1124.

Results show that the rate of the chemical deposition from solution of one metal on a crystal of another differs with the face exposed at the surface. An explanation for the results is proposed on the basis of interatomic distances. Monocrystalline spheres of copper were mechanically and electrolytically polished. They were immersed in potassium formate solutions of a cobalt salt at 180-250° C. and cobalt was catalytically deposited on the surface. The greatly different catalytic activities of the various faces were indicated by a pattern on the surface.

7C-16. Finishing Monel Metal. Edward Rosen. *Metal Finishing,* v. 47, Apr. 1949, p. 60-65.

Mechanical and chemical procedures, including recipes for the various solutions used.

7C-17. Tin Plating by Immersion Solves Difficult Problem. *Metal Finishing,* v. 47, Apr. 1949, p. 66-67.

Process for tin coating the insides of copper water tubing.

7C-18. Automatic Metal Spraying; Protection of Constructional Steelwork

by Aluminum. *Metal Industry,* v. 74, Mar. 18, 1949, p. 206-207.

Machine and process used. Results obtained.

7C-19. Improved Corrosion Resistance and Paint Adherence. *Die Castings,* v. 7, Apr. 1949, p. 59-60.

Chromate finish, developed during the war to permit use of zinc die castings in tropical climates or salt atmospheres, which gives a good paint base while improving surface characteristics.

7C-20. Varnishing of Zinc Surfaces. George Reich and Edmund R. Thews. *Paint and Varnish Production Manager,* v. 29, Apr. 1949, p. 91-92, 94-95.

The various methods, including pre-treatments. Recommendations.

7C-21. High-Temperature Ceramic Coatings for Molybdenum. *Better Enameling,* v. 20, Apr. 1949, p. 6-7. A condensation of a paper by D. G. Moore, L. H. Bolz, and W. N. Harrison.

See abstract of *National Advisory Committee for Aeronautics,* Technical Note No. 1626, item 7c-30, 1948.

7C-22. The Growth and Structure of Thin Metallic Films. Henry Levinstein. *Journal of Applied Physics,* v. 20, Apr. 1949, p. 306-315.

Combines electron microscopy and electron diffraction in a systematic survey of thin metallic films and some factors affecting their structure. 16 ref.

7C-23. Polishing and Plating Swing Spout Faucets. Fred M. Burt. *Products Finishing,* v. 13, May 1949, p. 22-24, 26, 28, 30, 32.

Production procedure. Parts are made from brass, then sanded, buffed, polished, cleaned, and chromium plated, followed by final assembly, rigid testing and inspection, polishing, and packaging.

7C-24. Copper and Copper-Alloy Clads. W. L. Keene. "Engineering Laminates" (John Wiley & Sons, 1949), p. 408-425.

Historical development, methods of manufacture (casting, pressing, rolling), and miscellaneous properties, including corrosion resistance.

7C-25. The Exchange of Ag^+ Ions Between Aqueous Solutions and Surfaces of Metallic Silver. C. C. Coffin and I. I. Tingley. *Journal of Chemical Physics,* v. 17, May 1949, p. 502-503.

Results of a study made with the use of a radioisotope of silver.

7C-26. Hot Dip Tinning Zinc Die Castings. Hiram K. Barton. *Die Castings,* v. 7, June 1949, p. 43-44, 46, 58.

Permits use in food or beverage-handling equipment. Details of production tinning, together with recommendations for application.

7C-27. Electron-Microscopic Investigation of Structural Changes of Highly Dispersed Solid Bodies During Heating. (In Russian.) A. I. Echeistova and A. B. Shekhter. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), Jan.-Feb. 1949, p. 13-17.

Method was applied to investigation of "smoke" surface films of ZnO, MgO, Au and Ag during heating in air. It was found that the initial "lacy" structure of these smoke films changes into a denser, more compact structure during heating, as is shown by means of electron micrographs. This fact indicates high mobility for the atoms in the surface layer caused by heating to a certain temperature.

7C-28. Extending the Life of Tungsten Carbide Form Tools. Charles A. McQuarrie. *Tool Engineer,* v. 22, June 1949, p. 23.

Methods and material for tools used on Al and Mg alloys. Using a wooden wheel with a paste of diamond dust, the edge surfaces of the tool are burnished to a mirror finish. Wood permits surface refinement without the usual attention to spindle accuracy or wheel concentricity.

7C-29. Automatic Buffing of Plated Hub Caps. A. H. Allen. *Steel,* v. 124, June 27, 1949, p. 62-64.

Completely automatic setup.

7C-30. A Brief History of Tin Plate. Samuel S. Johnston. *Plating,* v. 36, July 1949, p. 711.

Developments since 1240.

7C-31. Rolled Gold Plate for Coating Nonferrous Metals. *Modern Metals,* v. 5, Aug. 1949, p. 25.

New method is claimed to save considerable time and to improve quality in comparison with conventional polishing and electroplating. Adapted particularly to jewelry, fountain pens, and similar items.

7C-32. Brass Parts Processed Automatically Through 9 Operations. *Industrial Heating,* v. 16, Aug. 1949, p. 1370-1372.

An almost completely mechanized installation comprises a unique system of continuous processing brass screw bases for house fuses, through a series of cleaning, annealing, and pickling operations which require but two relatively small, compact pieces of equipment.

7C-33. Precious Metal Paints. H. V.

Anderson. *Ceramic Age,* v. 54, Aug. 1949, p. 84, 86-87.
Paints as applied in the electrical and electronic fields rather than for decorative purposes. Properties and procedures for application to ceramic bodies.

7C-34. Vaporized Metals Coat Surfaces. Jerome L. Bleiweis. *American Machinist,* v. 93, Sept. 8, 1949, p. 118-122.
Plating Al onto glass, Zn onto paper, and Ag onto cellophane are among the many applications of the high-vacuum vaporization process described.

7C-35. Die Castings in the Automotive Industry: Hardware and Trim. *Die Castings,* v. 7, Sept. 1949, p. 18-20, 62-66.
Finishing procedures.

7C-36. Abrasive Blasting Applications. J. F. Farrell. *Die Castings,* v. 7, Sept. 1949, p. 45-46, 48-50.
As applied to die castings. Surface preparation before painting, removal of flash and burrs, and elimination of symptoms of porosity.

7C-37. Bronzing of Brass. Pierre Tyvaert. *Foundry Trade Journal,* v. 87, Aug. 25, 1949, p. 249. Translated from *Fonderie.*
Surface preparation, surface treatment, and drying procedures.

7C-38. Westinghouse Copper Wire Mill at Buffalo, New York. Part II. *Wire and Wire Products,* v. 24, Sept. 1949, p. 764-766, 800-801.
Enameling of round wire; other insulation for round wire; packaging, storing, and shipping.

7C-39. Chemical Treatments for Zinc Surfaces—A Review. H. A. Holden. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 57-65; discussion, p. 67-70.
Previously abstracted from *Sheet Metal Industries.* See item 7-409, 1947.

7C-40. Finishing Automotive Die Cast Parts. Herbert Chase. *Iron Age,* v. 164, Nov. 3, 1949, p. 89-91.
How high production rates for finishing Zn-alloy die-cast automotive parts are maintained through the use of tumbling and blasting equipment to remove flash and burrs, while a conveyerized automatic unit is utilized for dichromating parts to inhibit corrosion.

7C-41. An Electrolytic Wire Cleaner. C. B. Leape. *Organic Finishing,* v. 10, Nov. 1949, p. 12-13.
Equipment developed at Westinghouse to clean copper wire prior to enameling.

7C-42. Pickling of Nickel and High-Nickel Alloys. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 183-188.
Composition of solutions suitable for pickling various high-Ni alloys. Cleaning and degreasing treatments, and various dip and paste pickle solutions for removal of tarnishes, thick scales, and thin oxide films associated with different alloys. Importance of the absence of iron; methods for its detection and removal.

7C-43. Finishing Zinc and Zinc Base Alloys. Jerome L. Bleiweis. *American Machinist,* v. 93, Dec. 15, 1949, p. 129.
The Cronak process for increasing corrosion resistance and the "Ebonol Z" process for production of a jet black finish.

7C-44. Versatile Finishing Line for Furniture Hardware. *Die Castings,* v. 7, Dec. 1949, p. 42-44.
Cleaning and plating line for Zn-base die castings.

7C-45. Décapage du laiton avant nickelage. (Pickling of Brass Before Nickel-Plating.) Pierre Tyvaert. *Fonderie,* Sept. 1949, p. 1744.
A new method. The chemical composition of the pickling agent and the technique of pickling.

7D—Light Metals

7D-1. Finishing Washer Tubs and Machines. R. A. Moore. *Products Finishing,* v. 13, Dec. 1948, p. 54-56.
Use of organic finish known as "Superclad" for aluminum tubs and machines.

7D-2. Functional Use of Lacquer. George A. Moore, *Paint and Varnish Production Manager,* v. 29, Jan. 1949, p. 10, 12-13, 16-17.
Functions and applications. New developments in lacquering of aluminum.

7D-3. Vitreous Enamels for Aluminum. P. J. Carlisle, A. J. Deyrup and A. O. Short. *Finish,* v. 6, Jan. 1949, p. 42-43, 68, 70.
Comprehensive official release of technical data.

7D-4. Enamels for Aluminum Are Here. *Ceramic Industry,* v. 52, Jan. 1949, p. 73, 180.
Commercial application of methods and compositions developed by Du Pont. Details of procedure, including an accelerated spalling test.

7D-5. Prime Coating Aluminum Sheet. Clyde St. John. *Iron Age,* v. 163, Jan. 13, 1949, p. 42-45.
A wash primer containing a vinylbutyral resin pigmented with zinc

chromate is in use at Permanente Metals Corp. The technique used for coating sheet and coils. The coating is not disturbed by subsequent light drawing and forming and gives effective protection from corrosion.

7D-6. Vitreous Enamels for Aluminum. *Iron Age,* v. 163, Jan. 13, 1949, p. 57.

Recently announced Du Pont development.

7D-7. Vitreous Enamels for Aluminum. (Continued.) P. J. Carlisle, A. J. Deyrup, and A. O. Short. *Finish,* v. 6, Feb. 1949, p. 33-34, 44.

Production procedures. Frequency of testing; free-alkali and chromate determinations on the bath; bath preparation from various chromate sources; chemical requirements; bath corrections; and typical color-coat formulas.

7D-8. The Present Position Regarding Chemical Pre-treatments for Magnesium Alloys. S. E. Mayer. *Magnesium Review and Abstracts,* v. 8, Jan. 1948, p. 29-45.

Classifies treatments according to the chemistry of the film formed, giving bath compositions. Tabulates the various proprietary methods in seven groups with information on inventor, alternative designation, literature or patent reference, bath compositions, method of application, alloys for which suitable, purpose of treatment, general description, pre-treatment necessary, and special comments.

7D-9. Surface Treatment and Finishing of Light Metals: Part I. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2463-2470, 2484.

Development of light metals, their applications, and finishes. Compositions of the principal wrought and cast aluminum alloys. (To be continued.)

7D-10. Chemical Brightening of Aluminum and its Alloys; A Description of a New Process. V. F. Henley. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 382-384.

"Alpol" bright-dipping process developed in Britain and its applications.

7D-11. Le brunissage au tonneau des pieces en alliages d'aluminium. (Barrel Tumbling of Aluminum Alloy Pieces.) Charles Etienne. *Revue de l'Aluminium,* v. 25, Dec. 1948, p. 377-382.

Structural changes in the surface layer. Optimum conditions, including preparation for processing, time of tumbling, size of tumbling balls, their amount, etc. (To be continued.)

7D-12. Evaluation of Polishes for Use on Aluminum Aircraft Surfaces. Roy A. Machlowitz. *ASTM Bulletin,* Jan. 1949, p. 46-49.

The following test methods were employed: caking number, nonflammability, flash point, low-temperature stability, corrosiveness, abrasive number, coarse particles determination, and measurement of performance properties. Results of tests on 11 selected polishes.

7D-13. Alocrom: a New Pre-Treatment. *Light Metals,* v. 12, Feb. 1949, p. 71-77.

New chemical processing system for Al and its alloys said to provide at relatively low cost an excellent base for paint, and to improve resistance to abrasion and to chemical attack. Composition of the solution is not given.

7D-14. How to Apply duPont Vitreous Enamel on Aluminum Alloys. *Modern Metals,* v. 5, Feb. 1949, p. 26-29.

Method of application and testing. Includes metal pretreatment.

7D-15. Process Finishing Magnesium. S. H. Phillips. *Light Metal Age,* v. 7, Feb. 1949, p. 14-15, 22.

A few of the best-known chemical treatments, cleaning procedures and top finishes, particularly as applied to Navy planes by Douglas Aircraft.

7D-16. Le brunissage au tonneau des pieces en alliages d'Aluminium. (Barrel Tumbling of Aluminum-Alloy Objects.) (Concluded.) Charles Etienne. *Revue de l'Aluminium,* v. 26, Feb. 1949, p. 65-69.

Several methods for decreasing or eliminating defects occurring during treatment.

7D-17. Priming Paints for Light Alloys. J. G. Rigg and E. W. Skerrey. *Paint Manufacturer,* v. 19, Mar. 1949, p. 77-83.

Previously abstracted from *Journal of the Institute of Metals.* See item 7d-46, 1948.

7D-18. Oberflächenbehandlung von Aluminium. (Surface Treatment of Aluminum.) F. Solar. *Schweisstechnik,* v. 2, Sept. 1948, p. 113-116.

Different methods of treating the surfaces of welded Al articles, to improve their appearance and their resistance to mechanical, chemical, or electrical influences.

7D-19. Surface Treatment and Finishing of Light Metals. Part I. Development of Light Metals: Their Application and Finishes. (Concluded.) S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 585-593.

Choice of alloy and finish for

protection and decoration; and applications of light metals. Physical and mechanical properties of the principal British wrought-Al alloys. 139 ref. (To be continued.)

7D-20. Production-Line Processing of Aluminum for Painting. Arthur P. Schulze. *Industrial Finishing,* v. 25, Apr. 1949, p. 37-38, 40.

Simple cleaning and corrosion-proofing treatment used on aluminum castings for outboard motors.

7D-21. Modified Surface Treatment for Magnesium. *Iron Age,* v. 163, Apr. 28, 1948, p. 77. Based on report by L. Whitby, *Metallurgia,* Mar. 1949.

Appropriate additions of sodium dichromate to selenious acid baths provide a surface treatment for magnesium that compares favorably with standard chromate and seleium coatings from the standpoints of both salt-spray resistance and effectiveness as a paint base.

7D-22. Aluminum-Clad Products. E. H. Dix, Jr. "Engineering Laminates" (John Wiley & Sons, 1949), p. 382-402.

Core and coating compositions of the "Alclads"; method of bonding (hot rolling); corrosion resistance; thermal treatments; and mechanical properties. Briefly mentions "Magclad" sheet. 26 ref.

7D-23. Surface Finishing of Aluminium. I. Cladding, Spraying and Anodic Treatment. D. H. Napier and J. V. Westwood. *Chemical Age,* v. 60, Apr. 2, 1949, p. 488-490.

A review. 15 ref. (To be continued.)

7D-24. Cleaning Aluminum Sheet Prior to Spot Welding. Gerard H. Boss. *Metal Progress,* v. 55, Apr. 1949, p. 499-503, 522, 524; May 1949, p. 668-673.

Part I correlates available information on methods. Method and apparatus for measuring the electrical resistance of the surface film. Part II deals with degreasers; room-temperature deoxidizers; commercial cleaning practices; influence of prior heat treatment; effect of final rinse water; and miscellaneous observations.

7D-25. Chemical Surface Treatments for Metals. Part Two. A. E. Durkin. *Tool Engineer,* v. 22, May 1949, p. 34-36.

For Al and Mg. Comparative corrosion resistances of samples after salt-spray testing.

7D-26. Deposition of Metals on Aluminum by Immersion From Solutions Containing Fluorides. Samuel Heiman. *Journal of the Electrochemical Society,* v. 95, May 1949, p. 205-225.

New process for depositing Zn, Cd, and Sn by chemical displacement upon Al. Immersion solutions contain the metal sulfate and either HF or the fluoride anion. The deposited metals have good appearance, sound structure, and excellent adhesion. The Zn-Al bond is the best and is greater than the cohesive strength of the base metal. 58 ref.

7D-27. A New Pretreatment Process for Light Alloys: The Application of "Alocrom" to Wash Boiler Production. R. E. Shaw. *Sheet Metal Industries,* v. 26, May 1949, p. 1031-1034, 1036.

Use of this chemical surface treatment prior to painting Al-alloy washing-machine tubs. Test-panel photographs show comparative resistances to boiling soap solutions and to soaking plus abrasion of painted surfaces pretreated with degreasing solvent, alkali chromate, and Alocrom.

7D-28. Fundamentals in the Finishing of Magnesium. *Magazine of Magnesium,* May 1949, p. 2-5.

7D-29. Die Herstellung und Verwendung von hitzebeständigen Aluminiumuberzugen. (The Production and Use of Heat-Resistant Aluminum Coatings.) Gottfried Kremer and Karl Erich Volk. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 250-255; discussion, p. 255-257.

Results of a study of the appearance and corrosion-resistant properties of different aluminum coatings on alloyed, unalloyed, and cast steel, as well as on cast iron. 12 ref.

7D-30. Uber die chemische Erzeugung einer dickeren Magnesiumfluorid-Schutzschicht auf Magnesium-Legierungen. (The Chemical Production of a Heavier Protective Film of Magnesium Fluoride on Magnesium Alloys.) M. Staesche. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 99-102.

A primary film of magnesium hydroxide is applied by means of NaOH to the magnesium and converted, by boiling in fluoride solutions, into magnesium fluoride. 30-day tests in oxygen-containing sea water proved that the samples thus treated were highly resistant to corrosion.

7D-31. Four Finishes on Die Cast Aluminum: Bright Chrome; Satin Chrome; Bronze Wrinkle; Die Cut Inset. *Die Castings,* v. 7, June 1949, p. 23-24, 61-62.

Use on 16-mm. movie cameras. Design of parts.

7D-32. Surface Finishing and Protection of Magnesium Alloys. H. K. DeLong. *Products Finishing,* v. 13, June

1949, p. 72, 74, 76, 78, 80, 82, 84, 86, 88, 90.

Operational procedure. Surface conversion coatings by chemical dipping and anodic oxidation, painting, and electroplating.

7D-33. New Vinyl Resin-Phosphate Primer for Aluminum. *Products Finishing,* v. 13, June 1949, p. 106, 108, 110.

7D-34. La Préparation de l'Aluminium et de ses Alliages avant Peinture. (Preparation of Aluminum and Its Alloys Before Painting.) Jean Frasch. "Premier Congres Technique International de l'Industrie des Peintures et des Industries Associées," 1948 (André Tournon et Cie., Paris), p. 271-275.

The surface treatment recommended consists in a very careful degreasing-cleaning procedure followed by passivation of the metallic surface. Proposes use of "Framanol" and "Framalite," chemical compositions of which are given. Optimum conditions are indicated.

7D-35. Barrel Burnishing of Light Alloy Products. Ch. Etienne. *Engineers' Digest,* v. 10, May 1949, p. 172-174; June 1949, p. 203-204. Translated and condensed from *Revue de l'Aluminium* v. 25, Dec. 1948, p. 377-382; v. 26, Jan. 1949, p. 15-21; Feb. 1949, p. 65-69.

Previously abstracted from original. See items 7D-11 and 7D-16, 1949.

7D-36. Bulk Finishing and Ganged Machining at Dictaphone. *Die Castings,* v. 7, July 1949, p. 44-46, 58.

As applied to various aluminum dictaphone parts.

7D-37. Surface Finishing and Protection of Magnesium Alloys. H. K. DeLong. *Modern Metals,* v. 5, July 1949, p. 26-29.

Methods including surface conversion coatings by chemical dipping and anodic oxidation, painting, and electroplating.

7D-38. Finishing Treatments for Magnesium. Jerome L. Bleiweis. *American Machinist,* v. 93, July 28, 1949, p. 119.

Sealed chrome-pickle process and anodic treatment.

7D-39. Surface Treatment and Finishing of Light Metals. Part 3. Mechanical Surface Treatments and Finishes for Aluminium and Its Alloys. Part 4. Chemical Cleaning and Pre-Treatment Processes. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 26, July 1949, p. 1493-1504; Aug. 1949, p. 1731-1738, 1743.

63 references.

7D-40. Un nouveau procédé de brillantage de l'Aluminium: l'Alupol. (A New Process for Polishing Aluminum: The "Alupol" Process.) P. Juniere and C. Etienne. *Revue de l'Aluminium,* v. 26, June 1949, p. 216-218.

The process makes no use of electric current, but consists principally of two baths, according to the surface to be treated and to the result desired. The first has a polishing effect and a specific solvent action on surface irregularities; the second is a super-finishing bath. Both types of baths are used after heating to a carefully controlled temperature.

7D-41. Some Properties of Aluminium Flake Powder. 3. The Nature and Role of Leafing. Gunter W. Wendon. *Paint Manufacture,* v. 19, Aug. 1949, p. 265-271, 286.

The influence of a number of factors, including particle size and relative humidity on the leafing phenomenon. Methods for determination of leafing power are compared. Relative importance of leafing power and the various fields of application of Al flake powder.

7D-42. Finishing Alumtile, a New Building Material. Frank E. Ehrett and F. Harold Higgins. *Organic Finishing,* v. 10, Aug. 1949, p. 6-9, 14.

Unique method of production. Small and large tiles are precoated, then blanked and formed in a final operation.

7D-43. Cleaning Aluminum for Surface Treatment. Gilbert C. Close. *Light Metal Age,* v. 7, Aug. 1949, p. 6-7, 26-28.

Various methods used by Douglas Aircraft.

7D-44. Inorganic Finishes for Light Metals. Jerome L. Bleiweis. *Product Engineering,* v. 20, Sept. 1949, p. 114-118.

Cost, availability, and theoretical factors in the selection of electroplated metallic coatings, and oxide or chemical conversion coatings. Chemical treatments for optimum corrosion protection.

7D-45. Aluminum—Its Surface Preparation and Finishing. Part I. E. R. Yarham. *Products Finishing,* v. 13, Sept. 1949, p. 38-40, 42, 44, 46, 48, 50, 52.

Cleaning and degreasing, polishing processes, blasting, barrel polishing, and chemical surface treatments.

7D-46. Stand der Oberflächenschutzbehandlung der Leichtmetall-Legierungen. (Surface Protection Methods for Light-Metal Alloys.) E. Nachtigall. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 194-197.

Various methods and their effects on mechanical properties of the respective alloys.

7D-47. Ursache und Verlauf der spontanen Zersetzung von Trichloräthylen durch Aluminium. (Cause and Course of the Spontaneous Decomposition of Trichloroethylene by Aluminum.) Ludwig Metz and Alfred Roedig. *Chemie-Ingenieur-Technik,* v. 21, May 1949, p. 191-193.

Experiments were made to explain fires and explosions that occurred when Al alloys were degreased with C_2HCl_3. $AlCl_3$ catalyzes the condensation of C_2HCl_3 and the heat of the reaction dechlorinates the condensation products and completely oxidizes the Al chips. Proposes the use of tetrachloroethylene instead. 14 ref.

7D-48. Finishing Aluminum Tubs With a Durable White. P. C. Bardin. *Industrial Finishing,* v. 25, Sept. 1949, p. 18-20, 22, 24.

Modern production setup for cleaning, treating, and white enameling aluminum tubs and stands for washing machines.

7D-49. Polishing Aluminum With Abrasive Belts. *Reynolds Metals Technical Advisor,* no. 11, 1949, p. 1-2.

Different setups and polishing wheels. Belt recommendations and operating practice.

7D-50. How To Protect Aluminum Windows From Plaster and Mortar. *Modern Metals,* v. 5, Sept. 1949, p. 24-25.

Cleaning and conditioning with "Duridine" and coating with clear lacquer.

7D-51. Preparation of Aluminum Sheet Surfaces for Painting. Robert I. Wray. *American Paint Journal,* v. 33, Sept. 19, 1949, p. 28-29, 32, 34, 36, 38.

Recommended procedures for interior and exterior residential and industrial surfaces.

7D-52. Surface Treatment and Finishing of Light Metals: Part 4. Chemical Cleaning and Pretreatment Processes. S. Wernick and R. Pinner. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1953-1959.

A review. 128 ref.

7D-53. Metallizing Paper for Capacitors. H. G. Wehe. *Bell Laboratories Record,* v. 27, Sept. 1949, p. 317-321.

Two strips of Al are separated by two sheets of chemically pure Kraft paper.

7D-54. Protective Treatments for Aluminum. Jerome L. Bleiweis. *American Machinist,* v. 93, Oct. 6, 1949, p. 149, 151.

The Alrok process, the Alumilite process, and anodizing.

7D-55. Metal Finishing Process Information Sheets. V. George Black. *Product Engineering,* v. 20, Oct. 1949, p. 161.

Compilation of four different processes used in preparing and finishing magnesium.

7D-56. Finishing Operations in a "King-Size" Job Shop. Ezra A. Blount. *Products Finishing,* v. 14, Oct. 1949, p. 10-18, 20.

Aluminum parts are fabricated and finished by anodizing, phosphatizing, and spray painting.

7D-57. Plating Aluminium. S. Heiman. *Metal Industry,* v. 75, Sept. 23, 1949, p. 246-249.

Previously abstracted from *Journal of the Electrochemical Society.* See item 7D-26, 1949.

7D-58. Hoover Cleaners Finished in Wrinkle. *Organic Finishing,* v. 10, Sept. 1949, p. 17-19.

Procedures for finishing die-cast Al housings.

7D-59. The Surface Finishing of Aluminium. James F. Driver. *Machinery Lloyd* (Overseas Edition), v. 21, Sept. 24, 1949, p. 111-113.

Four British patented processes.

7D-60. (Book) **Finishes for Aluminum.** 124 pages. 1949. Reynolds Metals Co., 2500 S. 3rd St., Louisville 1, Ky. Free.

Basic information on various processes for applying surface finishes to aluminum as well as characteristics of these finishes.

7D-61. Can You Use Chemical Methods in Finishing Aluminum? *Steel,* v. 125, Oct. 31, 1949, p. 53-56, 58, 60.

Wide variety of protective and decorative finishes which can be produced economically by strictly chemical processes. Surface conversion coatings, frosted finishes, diffuse reflector finishes, various types of etched surfaces, chemically produced oxide coatings, and a method for producing bright chemical polish on aluminum by dipping.

7D-62. Application of Dyestuffs to Anodized Aluminium. V. F. Henley. *Light Metals,* v. 12, Oct. 1949, p. 536-542.

Coloring of anodic films on Al and its alloys using organic dyestuffs. Methods of treating such films prior to coloring and methods of after-treatment of colored anodic films.

7D-63. Importance de l'effet d'amortissement chimique dans le traitement des alliages de magnesium. (Importance of the Effect of Chemical Inhibition During Surface Treatment of Magnesium Alloys.) L. F. Le Brocq and H. G. Cole. *Métaux & Corrosion,* v. 24, July-Aug. 1949, p. 177-191.

Use of inhibitors during chemical surface treatment. Relationship of inhibitive effect of various materials on pH and composition of the bath.

7D-64. Vitreous Enameling Broadens Scope of Aluminum Applications. N. Bruce Bagger. *Materials & Methods,* v. 30, Nov. 1949, p. 55-56.

New low-temperature porcelain coating for Al alloys, which has excellent service properties and is available in many colors.

7D-65. Some Experiments on the Painting of Aluminium Alloys. W. A. Edwards. *Light Metals,* v. 12, Nov. 1949, p. 626-632.

Effect of type of paint and of type of alloy; intrinsic corrosion resistance of various Al alloys; effect of alloy variation on coating performance; performance of different finishes, and finishes for marine conditions.

7D-66. Pretreatment of Aluminum Sheet for Painting. G. W. Birdsall. *Metal Progress,* v. 56, Dec. 1949, p. 825-828.

In processing the sheet, an extremely thin layer of the base metal is dissolved to form the aluminum phosphates and other compounds that make up the coating.

SECTION VIII

ELECTRODEPOSITION and ELECTROFINISHING

8-1. The Effect of Ionic Addition Agents on the Polarization of Electrodeposition of Copper. Thomas B. Lloyd, Milton R. Lauver, and Frank Hovorka. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 341-352.

Cathode potentials were measured during electrodeposition of Cu on smooth platinum from a cupric nitrate solution. Various inorganic salts and acids were added to the simple bath and the resulting effect on cathode potentials noted. The effect of addition agents on surface appearance was also noted.

8-2. The Oxygen Efficiency in Anodic Oxidation of Aluminum. John Kronsbein. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 353-366.

Experiments led to the abandonment of the view that anodic coatings on aluminum "grow inward" because of slow chemical solubility of the oxide. Introduces the idea of "oxygen efficiency"—the fraction of the electric current responsible for formation of aluminum oxide, the remainder causing either generation of free oxygen or anodic dissolution of the metal. This leads to simple equations permitting correlation of current density, temperature of electrolyte, and concentration with efficiency.

8-3. Gold and Chromium Combination Plating. W. A. Hopkins. *Iron Age,* v. 162, Dec. 23, 1948, p. 60-61.

The area of the base nickel plate to be gold plated is masked during chromium deposition. Then the entire part, unmasked, can be gold plated since the gold will adhere to the nickel surface but not to the sections already covered with chromium.

8-4. Measurement of Chromium Plating Thickness. C. H. R. Gentry and D. Newson. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 759-765.

Semi-automatic apparatus for routine checking to specification limits by unskilled operators. Another device suitable for laboratory testing.

8-5. Notes on Bright Silver Plating. E. W. Wilson. *Electroplating and Metal Finishing,* v. 1, Dec. 1948, p. 788-790. A condensation.

Recommended procedures for surface preparation; CS_2 bright plating solutions; brightening with selenium compounds.

8-6. Chromium Plating in Maintenance Practice. Richard M. Wick. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 54-59; discussion, p. 59-60.

Miscellaneous examples. The high-speed method developed by the author is said to have led to major economies.

8-7. Barrel Plating; Plant—Processes—Electrolytes. R. Macnair. *Metal Industry,* v. 73, Nov. 5, 1948, p. 366-368; Nov. 19, 1948, p. 406-408; Dec. 3, 1948, p. 448-451.

The various types of plant, solution capacities, and current allowances. Latest developments in horizontal and automatic plating barrels.

8-8. Plating Decorative Automotive Hardware. Henry R. Hawkinson. *Products Finishing,* v. 13, Dec. 1948, p. 20-26.

New plating installation of Cannon Electric Development Co.

8-9. Barrel Finishing of Metal Products. Part 26. Barrel Finishing and Its Relation to the Stability of Electrodeposited Surfaces. H. Leroy Beaver. *Products Finishing,* v. 13, Dec. 1948, p. 38, 40, 42, 44, 46, 48, 50.

8-10. Ultramicroscopic Investigation of Electrolysis of Aqueous Solutions of Copper Sulphate. (In Russian.) M. N. Polukarov. *Zhurnal Obshchei Khimii* (Journal of General Chemistry), v. 18, (80), July 1948, p. 1249-1258.

The formation of colloidal systems in the pre-cathode zone of the electrolyte and direct participation of

such colloidal particles in the formation of cathode deposits were established.

8-11. Plating Shop Construction and Equipment. H. E. Hutchinson. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 163-167, (Reprint).

Notes are based on the author's experience of building and equipping a plating shop, in which Ag, bright Ni-Co and Cr are deposited. 11 ref.

8-12. Bright Nickel Plating Practice in the U.S.A. H. Silman. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 169-176; discussion, p. 176-178. (Reprint).

Methods for the bright nickel plating of steel, and the tendency towards use of organic bright solutions as against the cobalt-formate type of solution used almost exclusively in Britain.

8-13. Review of Methods of Thickness Testing of Electrodeposited Coatings. H. H. Egginton. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 191-198; discussion, p. 199-202. (Reprint).

Seven methods were checked against analysis of a given area which was accepted as the standard. Methods are classified in order of accuracy, ease of application, and equipment required.

8-14. Shear Tests of the Adhesion of Electrodeposited Chromium to Steel. E. Zmihorski. *Journal of the Electrodepositors' Technical Society,* v. 23, 1948, p. 203-213. (Reprint). Translated from the Polish.

Effects of the following variables: type of etching treatment used in preparation for plating, thickness of chromium deposit, composition of plating solution and current density, hardness of base metal, effect of heat treatment, and effect of rolling fatigue. Test method and results. Recommendations for surface preparation and thickness of deposit.

8-15. Le Chromage dur sur les alliages légers. (Hard Chromium Plating of Light Alloys.) Jos. Patrie. *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 335-338.

Experimental data permitted establishing optimum conditions for the electrodeposition of a rather thick coating of Cr (20μ-1 mm.) and the necessary composition of the electrolyte.

8-16. A Modern Electroplating Laboratory. Myron B. Diggin. *Plating,* v. 36, Jan. 1949, p. 38-45.

Laboratory of Hanson-Van Winkle-Munning Co.

8-17. Deposition of Precious Metal Alloys. II. Binary Silver Alloys From Acid Chloride Solutions. III. Platinum-Gold, Silver-Gold, and Silver-Platinum-Gold Alloys From Acid Chloride Solutions. A. K. Graham, S. Heiman, and H. L. Pinkerton. *Plating,* v. 36, Jan. 1949, p. 47-49, 79.

The previous section described numerous unsuccessful attempts to deposit Ag-Pt alloys from alkaline solutions. These first results were so discouraging that attention was turned to acid electrolytes. Satisfactory results were obtained in deposition of a variety of the compositions indicated above by use of acid chloride baths. 14 ref.

8-18. Heavy Chromium Plating of Massive Objects Is Big Business. *Plating,* v. 36, Jan. 1949, p. 50-53.

Some of the jobs done by Chromium Corp. of America in plants at Waterbury, Conn., Chicago, and Cleveland.

8-19. The Effect of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions. II. Correlated Abstract and Critical Review. D. T. Ewing and W. D. Gordon. *Plating,* v. 36, Jan. 1949, p. 58-61.

Part of AES Research Project No. 5.

8-20. Electrochemical Laboratory Devoted to Experimental and Service Work in Electroplating and Polishing. *Steel,* v. 124. Jan. 10, 1949, p. 66, 69.

New laboratory of Hanson-Van Winkle-Munning Co.

8-21. Zur Theorie der Bedeckungschichten an Anoden, (Concerning Theory of Anodic Deposition.) K. Konopicky. *Korrosion und Metallschutz,* v. 21, Mar.-Apr. 1945, p. 40-43.

An experimental study, confirming the assumptions from which come certain equations, and refuting Weiner and Halla's theoretical objections.

8-22. Electrolytes for Refining and Electrodeposition of Lead. I. Influence of Surface-Active Substances on the Kinetics of the Cathode Process and Structure of the Deposit. (In Russian.) M. Loshkarev and I. Mark. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, June 1948, p. 589-599.

Effects of a series of organic additives and anions on the kinetics and structure of the above. Surface activities of these substances were found to be the basic regulators of deposit growth. 16 ref.

8-23. Sur une cause d'erreur dans le tracé de la courbe courant-tension des électrolytes de polissage anodique. Application a l'étude du mécanisme du

polissage. (Concerning a Source of Error in Plotting the Current-Voltage Curve of Electrolytes for Anodic Polishing. Application to the Study of the Mechanism of Polishing.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 227, Sept. 20, 1948, p. 591-593.

Certain disagreements between actual and theoretical results based on the above curve were investigated. It was found that the curve depends to a great extent on the degree of smoothness or roughness of the surface being electro-polished.

8-24. Throwing Power of Electroplating Solutions. Part II. A. Mankowich. *Metal Finishing,* v. 47, Jan. 1949, p. 54-55; discussion, p. 55, 67.

Discussion of Haring and Blum's formula. Derivation, discussion of factors involved, and concluding remarks. Discussion is by Geo. E. Gardam.

8-25. Investigations on Cylinder-Liner Wear. Warren G. Payne and William F. Joachim. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 51-66; discussion, p. 66-68.

Previously abstracted from condensed version in *SAE Journal.* (See item 8-165, 1948.)

8-26. Thickness of Primary Growth Layers on the Face of Crystals on the Basis of Results of Micro-Interferometric Measurements. (In Russian.) K. M. Gorbunova and T. V. Ivanovskaya. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Sept., 1948, p. 1039-1042.

The above was investigated for monocrystals of silver developed on a platinum cathode during electrolysis of a 3N solution of $AgNO_3$.

8-27. Oscillographic Investigation of Cathode Potentials During Growth of Thread-Like Silver Crystals. (In Russian.) K. M. Gorbunova and A. I. Zhukova. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Sept. 1948, p. 1097-1099.

8-28. Ein verbessertes Beizverfahren zur Schnellprufung von Al-Cu-Mg-Verbundwerkstoffen auf Kupferdiffusion. (An Improved Pickling Process for Rapid Determination of Copper Diffusion in Al-Cu-Mg Plated Sheet Metal.) H. J. Seemann and M. Dudek. *Metalloberfläche,* v. 2, Apr. 1948, p. 84-87.

A new solution for the above.

8-29. Electrolytic Polishing of Brass Pressings. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 3-5, 42.

Procedure used by a British firm.

8-30. Bright Chromium Plating. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 6-11.

Tabulates the more usual faults and their remedies, with notes on operating conditions.

8-31. High Speed Automatic Nickel Plating With Notes on Rainbow in Chromium Plating and on Electropolishing of S.A.E. 1010 Steel. Albert Hirsch. *Plating,* v. 36, Feb. 1949, p. 138-140, 176.

Operating conditions which resulted in a minimum tendency toward the defect known as "rainbow." Experiences with electropolishing of SAE 1010 using a sulfuric-phosphoric bath.

8-32. Wire Screen Plating. *Plating,* v. 36, Feb. 1949, p. 142-147.

Equipment and procedures for wiredrawing, screen weaving, and continuous cleaning, electroplating of successive layers of Ni and Zn, and finally passing through infrared burners producing the Ni-Zn alloy phase characteristic of Corronizing.

8-33. Deposition of Precious Metal Alloys. IV. Bromide, Iodide and Fluoride Systems. A. K. Graham, S. Heiman, and H. L. Pinkerton. *Plating,* v. 36, Feb. 1949, p. 148-153.

Chemistry of the halides of Ag, Au, Pt, and Cu; the general experimental plating procedure used; and the results obtained with different combinations.

8-34. Determination of Impurities in Electroplating Solutions. XI. Traces of Ammonium in Nickel Plating Baths. Earl J. Serfass, W. S. Levine, and R. M. Davis. *Plating,* v. 36, Feb. 1949, p. 158-162.

Methods and standard procedure developed. Ammonium is separated by alkali treatment and steam distillation with a micro Kjeldahl apparatus. It is treated with Nessler's reagent, and the color is measured photometrically. 19 ref.

8-35. Automatic Silver-Plating; Plant and Processes for High Output. W. E. Hesselberger. *Metal Industry,* v. 74, Jan. 28, 1949, p.66-68, 73.

8-36. Machine Tool Plating Installation Engineered for Efficiency and Appearance. Ezra A. Blount. *Products Finishing,* v. 13, Feb. 1949, p.20-28.

Production of chromium-plated machine tool parts by Landis Tool Co.

8-37. Decorative Electroplating on Aluminum. Glenwood J. Beckwith. *Metal Finishing,* v. 47, Feb. 1949, p. 48-54.

Relationship of foundry practice and successful plating, for die, permanent-mold, and sand castings; polishing and buffing of castings,

extrusions, and stampings; ball burnishing; various cleaning procedures; chemical zinc coating; Cu, Ni, and Cr plating, and electropolishing of Cu plate; removal of Al from Ni baths; use of Al plating racks; salvaging of plated Al items.

8-38. A Semi-Bright Nickel Plating Process. Karl S. Willson and A. H. DuRose. *Metal Finishing,* v. 47, Feb. 1949, p. 55-57.

Process recently developed on a commercial scale. Characteristics are semi-bright luster, good buffability, and unusual ability to fill in surface irregularities. Operating features, advantages, and limitations.

8-39. Electroplating in the Spoon and Fork Trade. *Electroplating and Metal Finishing,* v. 2, Jan. 1949, p. 57-61. Based on paper by F. R. Hill, and accompanying discussion.

Equipment, procedures, and solutions. (To be continued.)

8-40. The Electrolytic Polishing of 18/8 Stainless Steel and Nickel Silver. H. Evans and E. H. Lloyd. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 73-84.

Electropolishing experiments were carried out on 18-8 stainless and nickel-silver cutlery and a number of other components of various metals and alloys, in various electrolytes over a range of temperatures and with various current densities at the anode. 11 ref.

8-41. The Effect of the Basis Metal on the Electrodeposition of Brass. W. D. Rae. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 85-96; discussion, p. 256-257.

Experiments indicate that nonuniformity of the electrodeposit is a major cause of unsatisfactory rubber-to-brass bonds and can arise either from depositing conditions or from the state of the base metal. Porosity increases danger of inclusion of foreign matter. Nonuniformity in the state of strain over the surface of the base metal and nonuniformity in chemical structure, especially when accompanied by nonuniformity in physical structure, also have a detrimental effect.

8-42. The Quantitative Adhesion of Nickel Electrodeposits to Aluminium Alloys. W. Bullough and G. E. Gardam. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 169-188; discussion, p. 263-267.

Standard method which will yield adhesion in excess of ultimate tensile strength for most alloys; a slight variation is necessary for high-Mg or silicon alloys. A theory of the adhesion process is proposed.

8-43. Pre-Treatment of Zinc Die-Castings Prior to Bright-Nickel Plating. P. Berger. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 207-218; discussion, p. 219-226.

Methods and sequence of operations. Undesirable phenomena such as over-cleaning, and their prevention. The reaction of zinc as a base-metal with electrodeposited undercoatings such as copper and brass, and the possible use of a Cu-Sn alloy as a substitute.

8-44. La résistance électrique de la cellule de polissage électrolytique et la superficie de l'anode. (Electrical Resistance in an Electropolishing Cell and the Anode Area.) Israel Epelboin and Claude Chalin. *Comptes Rendus* (France), v. 227, Oct. 27, 1948, p. 835-836.

Attempts to establish a relationship between resistance and anode area. Increase of the area results in decrease of resistance; agitation of the electrolyte, disturbing the anodic diffusion layer, also decreases the resistance caused by this layer. Therefore, the current-voltage curve may be changed for the same metal, the same bath, and otherwise identical conditions by variation in the anode area.

8-45 (Book). **Electro-Plating and Anodising. Ed. 4.** E. Molloy, editor. 230 pages. George Newnes, Ltd., Tower House, Southampton St., Strand, London, W.C.2, England. 7s. 6d. net.

Brief historical survey and general theory of the electroplating process. Industrial applications and techniques adopted for the electrodeposition of various metals. Types of equipment and plant layout. Causes and cures of troubles with nickel and chromium plating solutions. Electroplating of hardware; anodizing of aluminum, and testing of finished work.

8-46. The Measurement of Permeability Characteristics of Anodic Films on Aluminum. Robert L. Burwell, Jr., and Thomas P. May. "Pittsburgh International Conference on Surface Reactions", 1948, p. 10-20.

Previously abstracted from *Journal of the Electrochemical Society.* See item 8-252, 1948.

8-47. Surface Preparation by Electropolishing. Charles L. Faust. "Pittsburgh International Conference on Surface Reactions", 1948, p. 187-195.

The process, properties of electropolished surfaces, and applications. 94 ref.

8-48. Hard Chromium Plating of Plastic and Rubber Molds. J. C. Rogers.

India Rubber World, v. 119, Feb. 1949, p. 605-607.

Process, properties of the product, and applications. Includes surface preparation.

8-49. Direct Nickel Plating of Zinc Diecasting. *Iron Age*, v. 163, Feb. 24, 1949, p. 84.

8-50. A Plater's View of Designing. C. F. Nixon. *Plating*, v. 36, Mar. 1949, p. 235-238.

A general discussion.

8-51. The Plating Step in Clad Steel Manufacture. Albert D. Taylor. *Plating*, v. 36, Mar. 1949, p. 239-245.

Why and how nickel plating is used in the manufacture of stainless-clad and Inconel-clad steels.

8-52. Smoothing Effects of Nickel Deposits. K. S. Willson and A. H. DuRose. *Plating*, v. 36, Mar. 1949, p. 246-251, 275.

By proper choice of plating bath it is possible to obtain deposits that are much smoother than the base metal. This smoothing ability is not related to ability to produce bright coatings. Relative effects of original base-metal roughness and plate thickness.

8-53. Determination of Impurities in Electroplating Solutions. XII. Traces of Chromium in Nickel Plating Baths. Earl J. Serfass, W. S. Levine, and R. M. Davis. *Plating*, v. 36, Mar. 1949, p. 254-257, 260-261, 302.

Reviews the literature. Colorimetric method when appreciable amounts of Al, Cd, Cu, Fe, Pb, Mn, Si, Zn, or Ca are present singly or otherwise.

8-54. Pit Formations in Electrodeposits. E. R. Calderon. *Western Metals*, v. 7, Feb. 1949, p. 27-29.

The origin of the gas bubble which produces the pit; the cause of adherence of the bubble; the difference between adherent and nonadherent bubbles when deposition is accompanied by copious evolution of hydrogen; foreign particles in the bath.

8-55. Close-Fitting Paint Spray Masks by Electroforming. *Die Castings*, v. 7, Mar. 1949, p. 48-51, 53.

Production of the above and use in finishing die castings.

8-56. Electro-Deposition in the Production of Diamond Tools; A Patent Review. Paul Grodzinski. *Electroplating and Metal Finishing*, v. 2, Feb. 1949, p. 78-82.

One of the earliest proposed methods of bonding consists of coating diamond grains with a metallic film by electroplating and then binding the film to a metallic carrier body. This method, with improvements, is still widely used. Other related methods described in the patent literature.

8-57. Electrolytic Tinplating at the Republic Steel Corporation. *Electroplating and Metal Finishing*, v. 2, Feb. 1949, p. 83-88.

8-58. Control of Electroplating Solutions by Analysis and Observation. VI. The Control of Cadmium Cyanide Solutions. K. E. Langford. *Electroplating and Metal Finishing*, v. 2, Feb. 1949, p. 89-91.

Analytical methods for free cyanide and for caustic soda.

8-59. Efco-Udylite Bright Nickel. *Electroplating and Metal Finishing*, v. 2, Feb. 1949, p. 92-94.

A commercial solution sold by a British firm, its basic components, methods for maintenance and use.

8-60. Electroplating in the Spoon and Fork Trade. (Concluded.) *Electroplating and Metal Finishing*, v. 2, Feb. 1949, p. 129-133. Based on a paper by F. R. Hill, with additional information.

Current density, silver anodes, some plating difficulties, bright silver plating, silver finishing, chromium plating, speculum plating, and tarnishing of silver.

8-61. The Electrodeposition Behavior of a Simple Ion. L. B. Rogers and A. F. Stehney. *Journal of the Electrochemical Society*, v. 95, Feb. 1949, p. 25-32.

The Nernst equation predicts that the curve of % element deposited vs. potential should be independent of the amount of reducible element involved providing the "inert" electrode is incompletely covered with deposit, and all other factors are held constant. Deposition curves should shift with changes in electrode area, volume of solution, and size of the deposited atom. 13 ref.

8-62. The Electrodeposition Behavior of Traces of Silver. L. B. Rogers, D. P. Krause, J. C. Griess, Jr., and D. B. Ehrlinger. *Journal of the Electrochemical Society*, v. 95, Feb. 1949, p. 33-46.

By means of radioactivity, the extent of silver deposition on platinum cathodes was determined at various potentials under conditions closely approaching equilibrium. For concentrations of 10^{-7} M or less, the amount of silver was insufficient to cover the electrode and the resulting deposition curves often shifted to a more "noble" potential. The shift, which may be the result of alloy formation, was influenced greatly by the "inert" electrode material. 14 ref.

8-63. Electrodeposition and Electrowinning of Germanium. Colin G. Fink and Vasant M. Dokras. *Journal of the Electrochemical Society,* v. 95, Feb. 1949, p. 80-97.

Aqueous, non-aqueous, and fused electrolytes were studied. Deposition from aqueous baths is apparently limited to thin flashes of metal because of the very low overvoltage of hydrogen on germanium. Cu, Ag, Sn, Co, and Ni were each codeposited with Ge from aqueous solutions. 45 ref.

8-64. Acid Copper for Decorative Plating. John F. Beaver. *Metal Finishing,* v. 47, Mar. 1949, p. 48-50.

Advantages, shortcomings found during the past, recent developments which have eliminated many shortcomings, and present applications.

8-65. Note on an Examination of the Bendix Method for Determining Coating Thickness on Tinplate. F. W. Salt. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 118.

Use of the anodic polarization method described by Bendix, Stammer, and Carle in 1943, for routine indication of the time of completion of stripping of tinplate in recovery operations.

8-66. Quelques nouveautés sur le polissage électrolytique. (Some New Developments in Electropolishing.) P. A. Jacquet. *Journées des Etats de Surface,* 1946, p. 52-58.

See abstract from *Metal Industry,* item 7-13, 1946.

8-67. Le polissage électrolytique. Méthode de superfinition. (Electrolytic Polishing. Method of Super-Finishing.) M. Mondon. *Journées des Etats de Surface,* 1946, p. 59-66.

Methods of finishing of moving parts of engines, such as honing, lapping, super-finishing by the Chrysler method, and electropolishing (the latter particularly emphasized).

8-68. L'état de surface et les propriétés des dépots électrolytiques. (State of the Surface and Properties of Electrodeposits.) A. Glazunov and L. Jenicek. *Journées des Etats de Surface,* 1946, p. 85-89.

Influence of the state of surface on the corrosion-preventive properties of electrodeposited layers. Besides the conditions of the electrodeposition, one of the main factors is the state of the surface of the basis metal.

8-69. L'épitaxie dans les dépots électrolytiques. ("Epitaxis" in Electrodeposits.) Georges A. Homes and Marcel Maquestiau. *Journées des Etats de Surface,* 1946, p. 90-91.

"Epitaxis" refers to the mechanism by which a continuous crystalline structure, on an atomic scale, can be formed, joining the base metal and the electrodeposit, resulting in maximum adherence. The laws of "epitaxis" and the influence of various factors on the deposition of Cu on mono and polycrystalline Fe were investigated.

8-70. Plating Room Process Control in Action. Lawrence J. Durney. *Products Finishing,* v. 13, Mar. 1949, p. 32-34, 36, 38.

Causes for plating-room defects and control procedures.

8-71. Where Do We Go From Here? Part I. Joseph B. Kushner. *Metal Finishing,* v. 47, Mar. 1949, p. 71-73.

Future possibilities for technical progress in electroplating. (To be continued.)

8-72. Stress in Electrodeposited Metals. A. W. Hothersall. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 107-118; discussion, p. 398-431.

Stress is normally measured by the bending of a thin-strip cathode which is plated on one side only; various adaptations of this method. Cr, Co, Cu, Fe, Ni, and Ag are normally deposited in tensile stress which may reach 20-40 tons per sq. in. in Cr, Co, or Ni; Cd, Pb, and Zn deposits are generally in compressive stress which, for Zn, continues to increase after deposition is completed. The magnitude and sometimes the direction of the stress varies with conditions of deposition. 25 ref.

8-73. Sul tempo di fissaggio e sulle possibilita di migliorare la resistenza alla corrosione delle pellicole di ossidazione anodica sull'alluminio. (Concerning the Time of Fixing and the Possibility of Improvement of the Corrosion Resistance of the Anodic Oxidation Layer on Aluminum.) G. Bolognesi. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 572-575.

The corrosion resistance of anodic oxidation film was studied as a function of fixing and oxidation time. Treatment of the oxide layer with 5% solution of hexamethylenetetramine prior to fixing seems to improve the corrosion resistance.

8-74. Mechanism of Electrodeposition of Nickel. V. Conditions for Formation of Colloidal Solutions of Basic Salts During Electrolysis. (In Russian.) G. S. Vozdvizhenskii. *Zhurnal Prikladnoi Khimii* (Journal of Applied

Chemistry), v. 21, Nov. 1948, p. 1095-1098.

A method for theoretical calculation of the above conditions on the basis of free-energy changes.

8-75. Improved Electrolytes for the Anodic Polishing of Certain Metals. P. A. Jacquet. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 577-584. A condensation.

Improved electrolytes developed for polishing of steels, light alloys, and chromium. An acetic-perchloric mixture is primarily for metallographic purposes; optimum conditions established experimentally and treatment after polishing. For polishing Al-Mg-Zn alloys, a phosphoric-chromic acid mixture proved most suitable. 18 ref.

8-76. Plating and Pickling Beryllium-Copper Components. E. E. Halls. *Metallurgia,* v. 39, Feb. 1949, p. 181-186.

Oxide films formed during heat treatment are more difficult to remove by pickling than are those on most copper alloys. Details of a suitable procedure. Electrodepositing of various metals on beryllium-copper for corrosion protection, soldering assistance, and high-frequency conductivity.

8-77. Cathode Sputtering Grows as Plating Method. Thomas A. Dickinson. *Western Metals,* v. 7, Mar. 1949, p. 30-31.

Electrical method of applying various types of metallic films to surfaces that are usually nonmetallic in order to facilitate the manufacture of telescope reflectors, spectrometers, phonograph master records, and many similar products. It is considered superior to electroplating and alloy-spray processes when the materials are not electrochemically compatible and when extremely thin metal layers must be permanently applied without special binding mediums.

8-78. Principles of Electroplating. H. E. Linsley. *American Machinist,* v. 93, Mar. 24, 1949, p. 107-122.

Prepared for the metalworking executive whose interest in electroplating concerns only the broad aspects of the process. General methods and equipment involved in production plating of the commoner materials.

8-79. Electroplated Bearings. Ralph A. Schaefer. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 189-198; discussion, p. 205-207.

Properties of the various types, applications, and procedures. 24 ref.

8-80. A Spiral Contractometer for Measuring Stress in Electrodeposits. Abner Brenner and Seymour Senderoff. *Journal of Research of the National Bureau of Standards,* v. 42, Feb. 1949, p. 89-104.

Instrument entails electrodeposition of a metal coating on the outside of a metal helix and measurement of change in radius of curvature of the helix induced by stress in the electrodeposit. Formulas for the calculation of stress; sources of error and correction factors. Reproducibility of measurements and validity of the results. 21 ref.

8-81. Calculation of Stress in Electrodeposits From the Curvature of a Plated Strip. Abner Brenner and Seymour Senderoff. *Journal of Research of the National Bureau of Standards,* v. 42, Feb. 1949, p. 105-123.

Simplified formulas are derived from the fundamentals of the theory of elasticity. Correction factors for a number of variables and specific formulas for different experimental procedures.

8-82. Défauts d'oxydation anodique dus a la présence de chlorures. (Defects in Anodic Oxidation Caused by the Presence of Chlorides.) Jean Herenguel and Roger Segond. *Revue de l'Aluminium,* v. 26, Feb. 1949, p. 52-54.

Results indicate that chlorides cause important distrubances in the mechanism of anodic oxidation to chlorine ions, diffusing deeply into the oxide layers. Methods for avoiding the presence of chlorides in treated surfaces and in the electrolytic bath.

8-83. True Crystallochemical Theory of the Growth of Crystals During Electrolysis. (In Russian.) K. M. Gorbunova and P. D. Dankov. *Uspekhi Khimii* (Progress in Chemistry), v. 17, Nov.-Dec. 1948, p. 710-732.

Importance of crystallochemical, passivation, concentration, and hydrodynamic factors on the mechanism of the process of deposition of metals during electrolysis. Consideration of these factors permits development of the new theory of variation of electrode potential and discharge voltage during these processes. 31 ref.

8-84. Die Gasgehalte von Hartchromschichten bei der Abscheidung aus schwefelsauren Bädern. (The Gas Content of Hard-Chromium Plating Deposited From Sulfuric Acid Baths.) Walter Eilender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberfläche,* v. 2, July 1948, p. 141-143.

Effect of electroplating conditions on the absorption of hydrogen and

oxygen by the hard-chromium deposit. Results show that gas absorption increases with current density and decreases with temperature. Conditions for low-gas Cr-deposits.

8-85. Practical Aspects of Plating in the Spoon and Fork Trade. F. R. Hill. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 57-78. (Preprint.)

See abstract from *Electroplating and Metal Finishing,* items 8-39 and 8-60, 1949.

8-86. Large-Scale Electroplating Operations Combine Automatic and Bulk Processing. C. R. Fischrupp. *Steel,* v. 124, Apr. 4, 1949, p. 102-106.

Procedures involving use of full automatic and barrel equipment for zinc, nickel, and chromium plating of parts for telephone central-office switching apparatus.

8-87. Surface Preparation by Electropolishing. Charles L. Faust. *Journal of the Electrochemical Society,* v. 95, Mar. 1949, p. 62C-72C.

Previously abstracted from "Pittsburgh International Conference on Surface Reactions," 1948. See item 8-47, 1949.

8-88. Plating Home Appliances at Dazey Corp. Frank Bradley. *Metal Finishing,* v. 47, Apr. 1949, p. 49-51, 59.

Equipment and procedures. Pretreatments and non-electrolytic finishing processes.

8-89. Electropolishing Silver at Oneida, Ltd. Daniel Gray. *Metal Finishing,* v. 47, Apr. 1949, p. 55-59.

General theory and practice; practical adaptations.

8-90. Influence du polissage électrolytique sur les phénomenes de frottement et d'usure. (Influence of Electropolishing on the Phenomena of Wear and Friction.) Robert Mondon. *Revue de Métallurgie,* v. 45, Dec. 1948, p. 521-524.

Investigated for a Ni-Cr-Mo annealed steel, a Ni-Cr-Mo semi-hard steel, and a Cr-Mo nitrided steel. Advantages for electropolishing of machine parts subject to friction. On structural steels, such treatment had little effect.

8-91. Periodic Phenomena During Electrodeposition of Metals. (In Russian.) A. T. Vagramyan. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 22, Dec. 1948, p. 1496-1504.

A new method permitting accurate recording of the periodic fluctuation of potential with time. Such periodic fluctuation indicates four basic steps characterizing the processes occurring during the corresponding time intervals. 15 ref.

8-92. Control of Electroplating Solutions by Analysis and Observation. VII. The Control of Zinc Cyanide Solutions. K. E. Langford. *Electroplating and Metal Finishing,* v. 2, Mar. 1949, p. 143-144, 188.

Analytical methods for Zn, NaCN, and NaOH.

8-93. Electroplating in Spain. I. Commercial Considerations. II. Technical Considerations. III. The Rise and Present Position of Electroplating in Spain. Vincente Massuet Grau. **IV. Some Aspects of Electrodeposition in Spain.** J. Aguillo Marly and J. B. Vericat Raga. **Part V. Solutions and Techniques in Use at Marconi Espanola S.A.** *Electroplating and Metal Finishing,* v. 2, Mar. 1949, p. 145-160, 165-180.

Individual companies are listed and their activities described. (Parts I, II, and V are anonymous.)

8-94. Iodometric Determination of Glucose. *Electroplating and Metal Finishing,* v. 2, Mar. 1949, p. 184.

Simple method by which the glucose content of a plating bath can be readily determined.

8-95. Electrodeposition in Electrotyping Practice. *Electroplating and Metal Finishing,* v. 2, Mar. 1949, p. 195-198. Condensed from paper by P. B. Upton.

Recent work on Ni and Fe deposition in the printing industry, giving recommended solutions and conditions. 10 ref.

8-96. The Effect of Heat on Electro-Deposited Chromium. R. Graham, K. R. Williams, and R. W. Wilson, *Engineering,* v. 167, Mar. 18, 1949, p. 241-243; Mar. 25, 1949, p. 265-267.

Results of experimental work between 100 and 450° C. to determine the factors, other than poor adhesion, responsible for cases in which satisfactory wear resistance in the internal combustion engine was not obtained. No attempt was made to determine internal stresses, but superimposition of a.c. and d.c. during plating was tried unsuccessfully in an attempt to decrease stress and produce a discontinuous surface. Apparatus and procedure.

8-97. Grain Orientation in Nickel Plate as Related to Brightness: An X-Ray Diffraction Study. William Smith, James H. Keeler, and Harold J. Read. *Plating,* v. 36, Apr. 1949, p. 355-361.

Results show clearly that there is no over-all relation between preferred orientation (fibering) and brightness of nickel plate under the conditions considered. 20 ref.

8-98. Porosity of Electrodeposited Metals. IV. Measurement of Very Low Porosities by the Low Pressure-Constant Overpressure Method. N. Thon, Denis Kelemen, and Ling Yang. *Plating,* v. 36, Apr. 1949, p. 362-363, 366.

The crystal structure of nickel deposits can have a profound effect on their intrinsic porosity—porosity present in deposits free from visible pores and pits. Results were obtained by means of a newly devised technique, the constant overpressure method. It is shown that the permeability constant, the numerical measure of porosity, is the same whether calculated by the constant over-pressure method or the previously reported low-pressure equalization method.

8-99. Book. **Metal Coatings Produced by Electrolytic and Chemical Means and the Coloring of Metals.** Ed. 3. (In German.) Eugen Werner, 185 pages. 1948. Carl Hanser Verlag, Munich, Germany. 5.50 Deutsche Mark.

Principal processes, including reference to pretreatments. A final chapter gives advice on the lay-out and equipment of plating shops and describes plant for sand blasting, pickling, rinsing, and polishing.

8-100. Die Rolle der Inhibitoren und der Katalysatorgifte bei der elektrolytischen Abscheidung von Wasserstoff und der elektrolytischen Reduktion. (The Role of Inhibitors and Catalyst Poisons in the Electrolytic Evolution of Hydrogen and in Electrolytic Reduction.) Hellmut Fischer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie*, v. 52, May 1948, p. 111-133.

Critically discusses the above in connection with the cathodic separation and deposition of metals. Tables and graphs of data in the literature.

8-101. Uber periodische chemische Reaktionen. V. Das anodische Verhalten von Kupfer in Salzsaure. (Periodic Chemical Reactions. V. The Anodic Behavior of Copper in Hydrochloric Acid.) K. F. Bonhoeffer and Heinz Gerischer. *Zeitschrift fur Elektrochemie und Angewandte Physikalische Chemie*, v. 52. Sept. 1948, p. 149-160.

Results of extensive experimental study. Effects of numerous factors, apparatus.

8-102. Obtention de formes géométriques précises par polissage électrolytique. (Production of Precise Geometrical Forms by Electropolishing.) Pierre Michel. *Revue de Métallurgie,* v. 46. Jan. 1949, p. 39-44; discussion, p. 45.

Electropolishing to a tolerance of only a few microns appeared to be technically, but not economically, feasible. The process might be feasible if conducted with the more modern equipment.

8-103. Methods for Electroplating Metals on Nonconducting Materials. *National Bureau of Standards*, Letter Circular LC936, Jan. 14, 1949, 4 pages.

Details of the various methods may require modification for specific products.

8-104. Statistical Quality Control and the Electro-Deposition Process. G. F. Mortimer Young. *Electroplating and Metal Finishing,* v. 2, Apr. 1949, p. 229-237, 239-242.

System which covers all operations from start to finish of the process.

8-105. Control of Electroplating Solutions by Analysis and Observation. VIII. The Control of Nickel Plating Solutions. K. E. Langford. *Electroplating and Metal Finishing,* v. 2, Apr. 1949, p. 245-248.

8-106. Black Nickel Plating: Solutions, Defects and Remedies. *Electroplating and Metal Finishing*, v. 2, Apr. 1949, p. 249-252.

Defects, probable causes, and suggested remedies. Recommended solution recipes.

8-107. Electrolytic Polishing of Nickel: Recent American Developments Reviewed. *Electroplating and Metal Finishing*, v. 2, Apr. 1949, p. 253-256.

Phosphoric-sulfuric and phosphoric-chromic acid baths and procedures.

8-108. Recent Developments in Low Tension Power Supply. D. Ashby. *Electroplating and Metal Finishing,* v. 2, Apr. 1949, p. 273-283; discussion, p. 283-285.

Evolution of the modern low-voltage rectifier and important new developments in automatic control of plating operations.

8-109. Nickel Plating for Industry. *Canadian Metals and Metallurgical Industries*, v. 12, Apr. 1949, p. 20-21, 42.

Ni plating of miscellaneous industrial equipment. Advantages and examples.

8-110. Separating Films; A Key to Successful Electroforming. E. Mehl. *Metal Industry*, v. 74, Apr. 8, 1949, p. 268-269.

Requirements, types, and methods of applications of separating films required to facilitate removal of electro-formed articles from the mold, matrix, mandrel, or master. 12 ref.

8-111. The Electrolytic Polishing of Metals in Research and Industry. D. S. Kemsley and W. J. McG. Tegart. *Div. of Tribophysics, Council for Scientific and Industrial Research, Commonwealth of Australia*, Physical Metallurgy Report No. 7, 1948, 66 pages. (Serial No. A160.)

Mechanism; metallographic and research applications; and industrial methods and applications. 60 ref.

8-112. Die Herstellung von hartverchromten Gleitflächen mit guten Laufeigenschaften. (The Production of Hard-Chromium Plated Bearing Surfaces With Good Sliding Properties.) Karl Gebauer. *Metalloberfläche,* v. 2, Aug. 1948, p. 161-165.

The problem of lubricating chromium-plated sliding surfaces and methods of producing "oil-pockets" as a means of counteracting the poor wettability of chromium with oil. Structures of surface layers and bond to the base metal.

8-113. Special Light Alloys for Electro-Polishing. J. Hérenguel and R. Segond. *Engineers' Digest,* v. 10, Jan. 1949, p. 27-28. Translated and condensed from *Revue de l'Aluminium,* v. 25, Oct. 1948, p. 306-310.

Previously abstracted from the original, item 8-260, 1948.

8-114. L'Aluminium et ses alliages corroyés de qualité spéciale pour le polissage électrolytique et l'oxydation anodique. (Aluminum and Its Cold-Worked Alloys of Special Quality for Electropolishing and Anodic Oxidation.) J. Hérenguel and R. Segond. *Métaux & Corrosion,* v. 24, Feb. 1949, p. 45-49.

Need for improvement of the quality of Al and its alloys in order to improve the quality of electropolished and anodized products. Suggests that this can be done by investigating the effects of changes in heat treatment and cold working procedures on the quality of the finished products.

8-115. The Role of Natural Convection in Electrolytic Processes. Carl Wagner. *Journal of the Electrochemical Society,* v. 95, Apr. 1949, p. 161-173.

It is shown theoretically and experimentally that a well-defined convective flow due to the generally smaller density in the boundary layer and the resulting buoyancy exists at a vertical electrode. Interplay between diffusion and convective flow determines the limiting current density which occurs if such a voltage is applied that the concentration of one of the reactants at the electrode drops to zero. 11 ref.

8-116. Physical Properties of Iron Deposited From Chloride Baths. I. Larson, R. W. Moulton, and G. L. Putnam. *Journal of the Electrochemical Society,* v. 95, Apr. 1949, p. 86C-91C; discussion, p. 91C-92C.

Determination was made of the effects of pH, temperature, current density, and ferric-iron concentration. 15 ref.

8-117. Electro-Tinning Steel Strip; Expenditure of Electrical Energy. John H. Mort. *Iron and Steel,* v. 22, Apr. 1949, p. 112-116.

Develops calculation procedures. Typical applications. Consideration of the secondary process for conversion of the matte surface formed in the plating tank to a bright finish. This is done by raising the temperature to just above the melting point of the tin, followed by quenching and immersion in dilute chromic acid.

8-118. Production of Air-Cooled Copper Heads—for Bristol Sleeve-Valve Engines. Part II. Nickel-Plating of Copper Base; Assembly of Units; Centrifugal Brazing; Electrical Adhesion-Test. *Aircraft Production,* v. 11, May 1949, p. 168-171.

8-119. Barrel Gold Plating. Edward A. Parker. *Plating,* v. 36, May 1949, p. 448-451, 516.

Details of use of a solution of controlled low-gold, high free-cyanide content in barrel plating of jewelry and other decorative items. Uniformity of finish produced together with ease of control and low cost. It also serves as an excellent strike solution prior to heavy gold plating in barrels. Some work has been done on decorative and acid-resisting gold alloys, in particular pale yellow deposits, with the same general type of solution.

8-120. Manufacturing Electroplated Bearings. *Plating,* v. 36, May 1949, p. 452-455.

Equipment and forming, machine-shop, and inspection procedures.

8-121. The Practical Significance of Good Power Transmission. L. C. Borchert and R. B. Kinnaman. *Plating,* v. 36, May 1949, p. 456-461.

As applied to electroplating. Some of the defects noted if stray currents are allowed to exist, how to detect them and how plating systems can be engineered to prevent them, and means for their elimination.

8-122. Die Elektroplattierung nichtrostender Stähle. (Electroplating Stainless Steels.) R. Weiner. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 38-42.

Principles and different method

of silver and gold plating stainless steels.

8-123. The Purification of Plating Solutions. G. T. Colegate. *Electroplating and Metal Finishing,* v. 2, Apr. 1949, p. 221-228.

Methods of removal of the usual contaminants from the usual plating solutions. (To be continued.)

8-124. Adhesion Strength of Electrolytic Deposits. R. Erdmann. *Engineers' Digest,* v. 10, Apr. 1949, p. 116-117. Translated and condensed from *Metalloberfläche*, v. 2, May-June 1948, p. 117-119.

Factors affecting it.

8-125. Bright Nickel Plating Provides Low Cost Quality Finish. Jerome L. Bleiweis. *Materials & Methods,* v. 29, May 1949, p. 52-55.

Economical finishes and decorative effects otherwise unattainable are produced by bright nickel plating on various ferrous and nonferrous metals. Recommended cycles.

8-126. Physical Properties of Electrodeposited Metals—Nickel. Abner Brenner and Charles W. Jennings. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 31-50; discussion, p. 50-51.

Previously abstracted from *Plating,* item 8-276, 1948.

8-127. A Spiral Contractometer for Measuring Stress in Electrodeposits. Abner Brenner and Seymour Senderoff. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 53-76; discussion, p. 76-78.

Previously abstracted from *Journal of Research of the National Bureau of Standards,* item 8-80, 1948.

8-128. Methods for Testing Thickness of Electrodeposits. Effect of Internal Stress on Thickness Determinations by the Jet Method. Harold J. Read and J. Howard Thompson. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 79-85; discussion, p. 85-86.

Evidence presented indicates that at least one chemical-rate method of determining thickness is subject to errors due to internal stress and other but unknown physical properties of the deposit. Results emphasize the need for determining for each particular set of conditions under which work may be plated the factor which is to be used for conversion of penetration time to thickness.

8-129. Judging the Quality of Plated Parts. W. M. Phillips and F. L. Clifton. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 87-102; discussion, p. 102-104.

Confined largely to tests on parts plated for decorative use, particularly those finished with chromium.

8-130. Porosity of Electrodeposited Metals. Measurement of Intrinsic Porosity. N. Thon and Denis Kelemen. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 105-113; discussion, p. 114-118.

Previously abstracted from *Plating,* item 8-203, 1948.

8-131. Effect of Impurities and Purification of Electroplating Solutions. Some Effects of Copper in Nickel Plating Solutions on the Salt Spray Resistance of Nickel and Nickel-Chromium Deposits on Steel. D. T. Ewing, Robert Rominski, and William King. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 119-122; discussion, p. 122-124.

Previously abstracted from *Plating,* item 8-237, 1949.

8-132. Re-Oxidation of Trivalent Chromium in Chromic Acid Plating Baths. R. Seegmiller and V. A. Lamb. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 125-130; discussion, p. 131-132.

Results of quantitative and qualitative experiments made to determine the effect of sulfate content on the net reoxidation of trivalent to hexavalent chromium and also to define the conditions favorable to this oxidation. Practical application to plating problems.

8-133. Bright Barrel Plating of Nickel and Zinc. Leonard A. Chesworth. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 133-140; discussion, p. 140-141.

Requirements and recommended procedures.

8-134. Plating High Copper-Zinc Alloys. A. Kenneth Graham. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 143-156; discussion, p. 156.

Electrodeposition of so-called "copper bronzes", containing 85-95% Cu, has been used to produce deposits matching the color of cast or rolled "bronze" alloys of Cu-Sn or Cu-Zn. It has been confined largely to the coloring of steel-base hardware, lighting fixtures, and novelties. Experimental results showing effects of pH, ammonia, current density, temperature, copper concentration, agitation. Recommendations.

8-135. The Deposition of Metals on Plastics Employing Reduced Copper Films. Harold Narcus. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 157-167; discussion, p. 167-168.

Various processes for copper film formation and a process which is

being used commercially for metallizing all types of thermoplastic and thermosetting resins. However, need for further research is indicated. Apparatus for testing the adhesion of the composite metal coating to the plastic surface; some results. 10 ref.

8-136. A Circulating Electrolyte Cell for Strip Plating Evaluation. R. A. Dimon. *Proceedings, American Electroplaters' Society,* v. 35. 1949, p. 169-184; discussion, p. 184-185.

Previously abstracted from *Steel,* item 8-213, 1948.

8-137. The Electroplaters' Metals of the Future. Frederick A. Lowenheim. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 187-201; discussion, p. 201.

16 metals are now being electrodeposited commercially. Systematically reviews the literature and discusses the possibilities for plating the other 57. 40 ref.

8-138. Diaphragm Tanks to Eliminate Roughness in Copper Plating. R. H. McCahan, C. E. MacKinnon, and D. A. Swalheim. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 203-210; discussion, p. 211-213.

Apparatus developed by DuPont to meet new high standards for finish of Cu plating used as an intermediate metal on which Ni and Cr are deposited. Alternative schemes.

8-139. Metal Cleaning and a Simple Test for Surface Cleanliness. George B. Hogaboom. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 215-219; discussion, p. 219-221.

Simple test solution and its use to check cleanliness of steel surfaces before electroplating.

8-140. Industrial Electropolishing. Charles L. Faust and E. E. Graves. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 223-236; discussion, p. 236-239.

An illustrated review. Advances since previous article by the senior author (1946). 24 ref.

8-141. Electropolishing Silver in Cyanide Solutions. Daniel Gray. *Proceedings, American Electroplaters' Society,* v. 35, 1949, p. 241-246; discussion, p. 246-249.

Details of commercial procedure and now in use for large-scale silverware production.

8-142. Belgian Method of Copperplate Protection for Mirrors Explained by Specialist in Process. Alexis Preat. *Glass Digest,* v. 28, May 1949, p. 18, 26.

Process now in commercial production in Belgium, in which the silver-mirror deposit is plated with copper.

8-143. The Estimation of Small Amounts of Zinc and Cadmium in Nickel Baths. K. Gardner. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 303-306.

Shortened method for the polarographic determination.

8-144. Barrel Plating Without Tears. A. W. Wallbank. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 355-358; discussion, p. 358-359.

8-145. A Consideration of the Mechanisms of Electrodeposition Reactions and Overvoltage. A. L. Ferguson. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 50-57; discussion, p. 127-141.

In general terms. Outline of work since 1920 in the Electrochemistry Laboratory of the University of Michigan. Conclusions reached as a result of experiments. The author finds it impossible to account for many experimental facts on the basis of modern theories. However, the theory that the hydrogen-electrode potential is always determined by the activity of hydrogen atoms and ions at the electrode-solution interface explains most of the results.

8-146. Hydrogen Overvoltage. A. Frumkin. "Electrode Processes" (*Discussions of the Faraday Society,* No. 1, 1947), p. 57-67; discussion, p. 127-141.

In the case of hydrogen evolution on mercury from acid solutions, the slowest stage of the reaction is the discharge of hydrogen ion which completely determines the kinetics of the over-all reaction. In the case of cathodes with low overvoltage, the rate of the discharge stage can also be determined experimentally; however, the rate is also affected by subsequent stages. Over-voltage remains unchanged when the anodic process and dissolution of the metal occur simultaneously thus making possible conclusions regarding steady-state potential and rate of dissolution of metal. 43 ref.

8-147. Some Electron Transfer Processes in Heterogeneous Systems. Part I. Electrodeposition of Hydrogen. J. Weiss. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 68-71; discussion, p. 127-141.

Theoretical analysis of electrodes of low overvoltage, where the discharged atoms are strongly adsorbed and electrodes of high overvoltage, where the H atoms are only weakly adsorbed. 11 ref.

8-148. The Theory of Overvoltage. René Audubert. "Electrode Processes"

(Discussions of the Faraday Society, no. 1, 1947), p. 72-80; discussion, p. 127-141.

Recent experimental work which makes possible satisfactory theoretical interpretation of many observations. 14 ref.

8-149. The Interpretation of Overpotential Measurements. J. N. Agar. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 81-86; discussion, p. 127-141.

The influence of temperature and of concentration of reactants and neutral salts on overvoltage, and some of the possible implications of experimental results in this field. 23 ref.

8-150. Studies in Electrolytic Polarisation. II. The Effect of the Solvent on the Hydrogen Overpotential. J. O'M. Bockris. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 95-106; discussion, p. 127-141.

Hydrogen overvoltage on Pb, Cu, and Ni cathodes was measured in solutions of HCl in methyl and ethyl alcohols, ethylene glycol, formic and acetic acids, ether, and dioxane and in mixtures of these with water except in the cases of formic acid and ether. Long time-decay and the effect of stirring. Results do not agree with known versions of the neutralization or reaction-rate theories. Suggests a catalytic mechanism, in which adsorbed solvent molecules influence the rate of formation of H_2 molecules from H atoms. 27 ref.

8-151. Deposition of Metals. Introduction. A. W. Hothersall. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 141-144.

Introduces five papers on the subject.

8-152. Crystal Growth at the Cathode. G. I. Finch, H. Wilman, and L. Yang. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 144-158; discussion, p. 190-200.

Literature on the above as revealed by use of the microscope, by X-rays, or by electron diffraction. Diffraction patterns of electropolished Cu crystals, of Ag, Au, and Ni on Cu crystals, and of Ni and Zn deposits. 64 ref.

8-153. The Influence of Change of Size in Electrochemical Systems. J. N. Agar and T. P. Hoar. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 158-162; discussion, p. 190-200.

Consideration of two cells having the same electrolyte and electrodes, but differing in size, shows that they are not, in general, true models of one another, as regards magnitude and distribution of current and potential. In very large cells, the resistance of the electrolyte becomes the most important factor, while in very small cells electrode polarization is predominant. Two cells of different sizes may be true models of one another provided the specific conductivity of the electrolyte is made proportional to the linear dimensions.

8-154. Factors in Throwing Power Illustrated by Potential-Current Diagrams. T. P. Hoar and J. N. Agar. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 162-168.

Relationships between current, potential, and resistance for the Haring throwing-power cell. The influence of electrolytic resistance, cathodic polarization, cathodic current density, cathodic current efficiency, and size of cell. 15 ref.

8-155. Overvoltage in Metal Deposition and Dissolution. I. Nickel. F. W. Salt. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 169-181; discussion, p. 190-200.

The electronic interrupter devised by Hickling was used to study the decay of polarization which accompanies the electrolytic deposition and dissolution of nickel, and to determine the polarization free from resistance error. The influence of current density, pH, buffering agents, nickel-ion activity, and temperature. 18 ref.

8-156. Polarisation in the Electrodeposition of Metals. G. E. Gardam. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 182-190; discussion, p. 190-200.

Cathodic polarization of a metal-deposition process is caused by one or more of the processes necessary to bring the hydrated and possibly complex metal ion to the cathode, ada an electron to it, and build the resulting atom into one of the grains comprising the cathode deposit. The extent to which each of these may affect polarization. 25 ref.

8-157. Oxygen Overvoltage. Part I. The Influence of Electrode Material, Current Density, and Time in Aqueous Solution. A. Hickling and S. Hill. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 236-246; discussion, p. 248-254.

A thorough survey was made of

conditions necessary to obtain reproducible oxygen overvoltage measurements, and an experimental method was developed which gives reliable values. This method was applied to a study of the behavior of 12 different anode metals in alkaline solution over the current density range 10^{-5} to 1 amp. per sq. cm. 23 ref.

8-158. The Anodic Behaviour of Metals. Part IV. Silver. A. Hickling and D. Taylor. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 277-285; discussion, p. 298-302.

The initial build-up of anodic polarization at a silver anode over a wide range of conditions, using the cathode-ray oscillograph. In NaOH solution three main stages were distinguished: charging of a double layer, formation of an Ag_2O film, and formation of an oxide of silver higher than Ag_2O_2 which decomposes to give the latter substance. Below about pH 9 a silver anode does not become satisfactorily passive and the anodic process is merely the dissolution of silver. 13 ref.

8-159. The Standard Electrode Potentials of the Elements. J. O'M. Bockris and J. F. Herringshaw. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 328-334.

Results of a comprehensive and critical examination and correlation of literature data. 120 ref.

8-160. Abscheidungsgeschwindigkeit und Struktur der Hartchromniederschläge in Chrombädern mit abnorm hohem Schwefelsäuregehalt. (Rate of Deposition and Structure of Hard-Chromium Deposits in Chromium Baths With Abnormally High Sulfuric Acid Contents.) R. Bilfinger. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 27-30.

Rate of Cr deposition is increased if the higher H_2SO_4 concentration is accompanied by higher current densities and higher bath temperatures. Three factors affect the density and porosity of the Cr deposit.

8-161. Zur Theorie der Chromabscheidung aus wässrigen Chromsäurelösungen. (The Theory on the Deposition of Chromium From Aqueous Chromic Acid Solutions.) Erich Muller. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 110-120.

An extensive theoretical discussion.

8-162. Das Dickenwachstum anodisch erzeugter Oxydschichten auf Aluminium und seine Grenzen. (The Increase in Thickness of Anodically Produced Oxide Films on Aluminum and Its Limits.) G. Elssner and A. Beyer. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 120-130.

In the anodization of articles with small holes (0.5-2.0 mm.), changes in dimensions and hardnesses do not follow the generally valid laws of the growth of films. Approximately uniform hardness can be obtained by controlling the time and temperature of the treatment. 11 ref.

8-163. Untersuchung uber den Einfluss von hochfrequenten Wechselströmen bei der elektrolytischen Abscheidung von Chrom. (Research on the Effect of High-Frequency Alternating Currents on the Electrolytic Deposition of Chromium.) R. Bilfinger. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 131-135.

Experiments show no desirable effects for the above. The effects of superimposed high-frequency a.c. on current output in the electrodeposition of Ni from a commercial Ni-plating bath and of Cu from a cyanide-containing bath were also determined.

8-164. Eigenschaften und Bedeutung der Kobaltuberzuge. (Properties and Significance of Cobalt Coatings.) A. Kufferath. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 135-136.

Includes a discussion on the defects of cobalt electroplates, their causes, and methods of elimination; also the simultaneous deposition of Ni and Co. 11 ref.

8-165. Die Hartverchromung des Aluminiums und seiner Legierungen. (Hard-Chromium Plating of Aluminum and Its Alloys.) K. Gebauer. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 172-178.

Several methods. Properties and uses of the products.

8-166. Zusammenhänge zwischen Entstehungsbedingungen und Form elektrolytisch gewachsener Metallkristalle. I. Zur Entstehung von Blockstrukturen elektrolytisch gewachsener Metallkristalle. II. Die Rolle der Inhibitoren bei mässiger Inhibition. (Relationships Between Conditions of Formation and Shape of Electrodeposited Metal Crystals. I. The Formation of Block Structures in Electrodeposited Metal Crystals. II. The Role of Inhibitors Having a Moderate Effect.) Hellmut Fischer. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 161-170; July 1948, p. 204-210.

In Part I, a theory of crystal

growth, showing effects of a variety of factors. Dimensions of growth layers are calculated for silver crystals. Results indicate that the surface is never wholly passivated, but always retains some residual activity. Part II presents effects of mild inhibitors.

8-167. Production Line Plating on Magnesium. *Steel,* v. 124, May 30, 1949, p. 56-58, 86.

Newly-developed process for plating Cu, Ni, Cr, Au, Ag, brass, and other metals on Mg articles. Consists of an initial application of an immersion Zn coating followed by Cu striking and electroplating in standard plating baths.

8-168. Cobalt-Nickel Deposition in Electrotyping. R. F. Ledford. *Plating,* v. 36, June 1949, p. 560-565.

Steps in manufacture of electrotypes. Requirements, Co-Ni deposits, effects of variables, stress measurements, effect of impurities, and their removal.

8-169. Plating of Bright Nickel and Decorative Chromium Without Reracking, Arthur W. Logozzo, *Plating,* v. 36, June 1949, p. 567-570, 660.

Problems of racking, rack coatings, and control of metallic impurities in bright-Ni baths.

8-170. Use of the Cathode Ray Oscillograph in the Measurement of Metal Areas and the Kinetics of Electrode Reactions. A. T. Hutcheon and C. A. Winkler. *Canadian Journal of Research,* v. 27, sec. B, Apr. 1949, p. 353-360.

The instrument was developed to obtain information on the change in surface area during cadmium deposition, in order to find "true current density"—polarization relations. 10 ref.

8-171. Recent Developments in Plating on Plastics. Allen G. Gray. *Products Finishing,* v. 13, June 1949, p. 94, 96, 98, 100, 102, 104, 106.

Method which employs reduced copper films.

8-172. Plating Magnetic Cobalt-Nickel Alloys on Wire. *Iron Age,* v. 163, June 9, 1949, p. 49.

Process used by Brush Development Co. for electroplating silicon-bronze wire with 80% Ni-Co alloy.

8-173. Production Clinic for Finishing Die Castings. *Die Castings,* v. 7, June 1949, p. 39-42.

Reviews recent papers on: treatment of plating wastes; plating on lead and its alloys; and lacquers for rapid drying.

8-174. Un procédé d'étude et de régulation du polissage électrolytique des métaux. (A Method for Study and Regulation of the Electropolishing of Metals.) I. Epelboin, C. Chalin, and B. Galperin. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 151-154.

Electronic apparatus for recording the current-voltage curve during electropolishing. Possibility of application to process control. 14 ref.

8-175. Die anodische Oxydation des Aluminiums in verschiedenen zusammengesetzten Oxalsäurelösungen. (The Anodic Oxidation of Aluminum in Oxalic Acid Solutions of Different Compositions.) A. von Zeerleder and W. Hubner. *Chimia,* v. 3, Apr. 15, 1949, p. 77-84.

Effects of a series of above solutions over a range of pH values, temperatures, and voltages.

8-176. Die Hartverchromung von Kaltziehwerkzeugen kleiner Durchmesser. (Hard-Chromium Plating of Small-Diameter Cold-Drawing Tools.) Walter Eilender, Heinrich Arend, and Paul Form. *Metalloberfläche,* v. 3, Mar. 1949, p. 59-61.

Optimum hardness and thickness of plating with respect to wear resistance.

8-177. Ein Elektrolyt zum Atzpolieren von Stählen. (An Electrolyte for the Electropolishing of Steels.) Walter Eilender, Heinrich Arend, Ulrich Eggers, and Franz Sadrazil. *Metalloberfläche,* v. 3, sec. A, Apr. 1949, p. 88-90.

The explosive perchloric acid electrolyte was replaced by an electrolyte composed of H_2SO_4, H_3PO_4, and a little water. Satisfactory results are believed to justify commercial use.

8-178. (Book) **Canning Handbook on Electroplating.** Ed. 16. 553 pages. W. Canning & Co., Ltd., Great Hampton Street, Birmingham 18, England. 21s.

A practical guide and reference book for the supervisor, production manager, foreman plater, and others concerned with finishing operations. Separate sections are devoted to polishing; cleaning, pickling, and dipping; electroplating; and bronzing, lacquering, and enameling.

8-179. (Book) **Electrode Processes.** *(Discussions of the Faraday Society,* No. 1, 1947.) 338 pages. Gurney and Jackson, 98 Great Russell St., London, England.

Papers and accompanying discussion presented at Manchester, England, Apr. 9-10, 1947. They are classified under the headings: general and theoretical; deposition of hydrogen; deposition of metals; and anodic and other electrodic processes. Individual papers of

direct metallurgical interest are being abstracted separately.

8-180. (Book) **Répertoire Technique des Applications Industrielles du Chrome Dur.** (Hard Chromium Plating.) Paul Morisset. 220 pages. 1948. 209, bd. Saint-Germain, Paris 7, France. 600 Francs.

Properties of Cr. Process and the problems involved. 1119 ref.

8-181. The Production of Electro-Formed Moulds for Plastics and Die Casting. P. Spiro. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 13-32.

Process based on accurate machining of a plastics master giving it a high degree of finish. A shell of hard Ni is electroformed on the master. Shell is given a mirror finish, then mounted in a steel bolster. Problems involved and applications. 11 ref.

8-182. The Lead Plating of Bronze Bearing Surfaces for High Pressure Fuel Pumps. H. Silman and M. F. E. Fry. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 43-52; discussion, p. 53-58.

Procedure for increasing life of the Al-bronze rotor of a fuel pump for gas-turbine engines.

8-183. Notes on Bright Silver Plating. E. W. Wilson. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 139-142.

Previously abstracted from condensed version in *Electroplating and Metal Finishing,* item 8-5, 1949.

8-184. Electrodeposition of Speculum. J. W. Cuthbertson. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 143-150.

Speculum, an alloy of tin and copper, is employed primarily as a decorative finish. Procedure and improvements in process first introduced some ten years ago.

8-185. Practical Aspects of Speculum Plating. W. H. Sawyer. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 151-162.

In relation to normal plating-shop routine.

8-186. Electrodeposition in the Printing Industry. P. B. Upton. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 95-110. (Preprint.)

Reviews all aspects of the above.

8-187. Report of Committee B-8 on Electrodeposited Metallic Coatings. *American Society for Testing Materials,* Preprint 15, 1949, 30 pages.

Proposals for changes in specifications and tests; as well as research reports on atmospheric exposure of electroplated lead coatings on steel and atmospheric exposure of Cu-Ni-Cr deposits on high-carbon steel. Method for preparation of high-carbon steel for electroplating.

8-188. The Purification of Plating Solutions. Part II. Nickel Solutions. G. T. Colegate. *Electroplating and Metal Finishing,* v. 2, May 1949, p. 307-315.

Methods for removal of metallic and organic impurities and suitability of each. (To be concluded.)

8-189. Modern Trends in Bright Nickel Plating; Description of a New Cobalt-Free Solution. *Sheet Metal Industries,* v. 26, June 1949, p. 1302-1304.

New British bright-nickel solution known as "Gleamax," and its use.

8-190. Plating Easily Buffed Nickel: the Perflow Process. T. S. Blair. *Iron Age,* v. 163, June 16, 1949, p. 86-89.

Process deposits a soft semibright nickel that fills in surface irregularities during plating and color buffs easily. It has provided substantial savings and increased production in the plating department of the plant described. Surface preparation is less critical, plating time has been reduced, and buffing capacity has been stepped up 25%.

8-191. Hard Chrome Plating Milling Machine Quills. Warren Schmidt. *Iron Age,* v. 163, June 16, 1949, p. 96-97.

Complete cost breakdown, enabling determination of a cost per sq. in. figure, and a description of the plating process, which is typical of applications to rebuilding of worn machine parts.

8-192. Notes on the Temperature Control of Steam Heated Plating Plant. *Electroplating and Metal Finishing,* v. 2, June 1949, p. 377-385.

Arrangements for control of bath temperatures.

8-193. The Purification of Plating Solutions. Part III. Conclusion. G. T. Colegate. *Electroplating and Metal Finishing,* v. 2, June 1949, p. 417-423, 425-426.

Copper, brass, speculum plating, zinc, cadmium, tin, silver, chromium, gold, and rhodium solutions.

8-194. Aggressive Aluminum Plating Plant. *Modern Metals,* v. 5, June 1949, p. 35-37.

Plant engaged in custom anodizing of aluminum products for various manufacturers.

8-195. Electropolishing Brass. Willard G. Axtell. *Iron Age,* v. 163, June 30, 1949, p. 48-51.

Bath and process applicable to brass and other copper alloys as well as to certain high-temperature alloys. Addition of organics to the

bath, to promote anodic-film formation, has proved to be the key to successful results. A simple and effective method for evaluating the reflective power of polished articles.

8-196. Electrodeposition of Rhenium From Aqueous Solutions. L. E. Netherton and M. L. Holt. *Journal of the Electrochemical Society,* v. 95, June 1949, p. 324-328.

Emphasis on semi-quantitative information about cathode current efficiencies.

8-197. Sur le polissage électrolytique de l'uranium en vue des études physico-chimiques et métallographiques. (Electrolytic Polishing of Uranium for the Purpose of Physicochemical and Metallographic Study.) Pierre A. Jacquet and Roger Caillat. *Comptes Rendus* (France), v. 228, Apr. 4, 1949, p. 1224-1226.

The method, electrolyte, and optimum conditions. The surface of uranium retains its brilliancy in a dry atmosphere after electrolytic polishing, but is coated with a yellowish film (UH_3) when subjected to an ordinary atmosphere.

8-198. Automatic Plating Control. Bath Operation at Constant Current Density. D. Ashby. *Metal Industry,* v. 74, June 17, 1949, p. 483-485.

Important developments in the automatic control of rectifiers for operating a bath at constant current density, regardless of the area of work. Automatic control equipment for chromic acid anodizing was developed.

8-199. Plating of Pressed Metal Powder Parts. A Preliminary Study. A. K. Graham, H. L. Pinkerton, E. A. Anderson, and C. E. Reinhard. *Plating,* v. 36, July 1949, p. 702-709.

Principal difficulties to be expected and general procedures for overcoming them. Points of principal importance are drag-over, finish perfection, mechanical preparation, spotting-out, and outdoor service.

8-200. Electrolytic Tin Plate. *Plating,* v. 36, July 1949, p. 712-716.

Procedure and equipment at the Weirton Steel Co.

8-201. Production Plating of Die Cast Automotive Trim. Ezra A. Blount. *Products Finishing,* v. 13, July 1949, p. 14-22, 24.

Procedure at the Electric Auto-Lite Co., Lockland, Ohio.

8-202. Amperometric Determination of Sulfates in Nickel-Plating Baths. (In Russian.) V. F. Toropova, E. A. Zimkin, and A. A. Popel. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 404-407.

Two methods for determining SO_4 ions in the presence of Cl ions are proposed: precipitation of Cl by $AgNO_3$, followed by titration of SO_4 in the presence of AgCl; and formation of a Pb acetate complex which impedes precipitation of $PbCl_2$.

8-203. Dispersed Deposition of Metals at High Current Densities. (In Russian.) M. Loshkarev, A. Ozerov, and N. Kudryavtsev. *Zhurnal Prikladnoi Khimii (Journal of Applied Chemistry),* v. 22, Mar. 1949, p. 294-306.

A theory for the mechanism of the influence of diffusion processes on the structure of the cathode deposit. It is shown that, during electrolysis with above currents, deposition should take place in dispersed form. 17 ref.

8-204. Trumapparater kontra klockapparater. (The Rotating Versus the Rocking Electroplating Barrel.) S. V. Ekström. *Finish* (Sweden), v. 6, Mar. 1949, p. 64-66.

Relative efficiency and utility.

8-205. Uber die Hartverchromung mit uberlagertem hochfrequentem Wechselstrom, (Hard Chromium Plating With Superimposed High-Frequency Alternating Current.) Fr. Muller, W. Eilender, and K. M. Wagner. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 135-140.

Two different laboratories investigated independently the claims of the inventor of the Hausner process.

8-206. Die Rolle der Gefuge Bestandteile bei der anodischen Oxydation von Aluminiumlegierungen. (The Role of the Structural Constituents in the Anodic Oxidation of Aluminum Alloys.) Hellmut Fischer. *Metalloberfläche,* v. 3, June 1949, p. A117-A125.

The nature of the reaction of impurities with alloying constituents and the properties of the resulting anodic oxide films. Various constituents undergo a topochemical reaction. Structures of the oxide layers.

8-207. Uberprufung der Methoden zur Ausfällung von Zink aus Nickelbädern. (On the Rochelle Salt-Copper Bath.) Richard Erdmann. *Metalloberfläche,* v. 3, June 1949, p. B38-B39.

Advantages and methods of using Rochelle salt for electrodeposition of copper.

8-208. Copper Plating From Straight Cyanide Electrolytes. E. E. Halls. *Sheet Metal Industries,* v. 26, July 1949, p. 1505-1508.

Bath compositions used for copper plating and results of experiments on straight cyanide electrolytes varying primarily with respect to free-cyanide content. Working temperatures up to 50° C., and current densities up to 20 amp. per sq. ft. were covered.

8-209. Practical Points on Nickel Plating. Robert L. Buckley. *Electroplating and Metal Finishing*, v. 2, July 1949, p. 467-471.

Types and characteristics of solutions, maintenance and control of Ni solutions, pH control, and specification of thickness.

8-210. ETS Visit Ford at Dagenham. *Metal Industry*, v. 75, July 1, 1949, p. 7-9, 13.

Members of the Electrodepositors' Technical Society visit electroplating division. Equipment and procedures.

8-211. Rinsing. I. With Single-Compartment Tank. Joseph B. Kushner. *Plating*, v. 36, Aug. 1949, p. 798-801, 866.

A mathematical treatment on the control of the amount of rinse water to obtain good plating at lowest overall cost.

8-212. Calculation of Stress in Electrodeposits From the Curvature of a Plated Strip. Abner Brenner and Seymour Senderoff. *Plating*, v. 36, Aug. 1949, p. 810-816.

Previously abstracted from *Journal of Research of the National Bureau of Standards*, item 8-80, 1949.

8-213. Determination of Impurities in Electroplating Solutions. XIII. Traces of Zinc in Nickel Plating Baths. W. S. Levine, P. J. Prang, M. H. Perry. *Plating*, v. 36, Aug. 1949, p. 818-823.

A colorimetric method for the above was developed using dithizone. Zn is determined colorimetrically by measuring the amount of incident light absorbed by red zinc dithizonate in a colorimeter with a green filter. 30 ref.

8-214. Electrolytic Deposition of Zinc at High Current Densities. (In Russian.) N. P. Diev. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Apr. 1949, p. 361-366.

Influence of variations in current density, zinc concentration, organic addition agents, rate of circulation, and distance between electrodes. Character of deposits.

8-215. Distribution of Metal Deposited on Cathode Surfaces from Zincate Electrolytes. (In Russian.) N. T. Kudryavtsev and A. A. Nikiforova. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22 Apr. 1949, p. 367-376.

Comparative investigation of the above with addition of tin, depending on concentration of zinc and free alkali hydroxides, and also on temperature and current density.

8-216. Electrolytic Zinc Coating in Zincate Electrolytes at High Current Densities. (In Russian.) N. T. Kudryavtsev, A. I. Lipovetskaya, and K. N. Kharlamova. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, Apr. 1949, p. 377-384.

The influence of special additions and of agitation of the electrolyte on the upper limit of safe cathode current density and on diffusion ability of the bath. It was found that only Sn, Pb, and Hg have positive influence on the cathode process, and that agitation considerably raises the upper limit of safe cathode current density, accelerating zinc plating.

8-217. Anodic Dissolution of Etched Metal. (In Russian.) G. S. Vozdivizhenskii, G. P. Dezider'ev, and D. A. Dmitriev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 65, Apr. 11, 1949, p. 697-699.

Attempts to prove, by experimental investigation, the formerly proposed theory that the process may be considered as a form of "electrodecrystallization." Results of experiments on copper and brass are charted and discussed. They indicate that the process is regulated by the degree of crystalline homogeneity of the surface.

8-218. Amperometric Determination of Certain Basic Components of Electroplating Baths. (In Russian.) N. G. Chovnyk, N. N. Kuzmina, A. N. Galkins, and B. Ya. Starik. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 517-522.

Method for determination of Cu, Ni, Zn, and sulfate ions as applied to electroplating baths. Data comparing amperometric values with those obtained by usual means.

8-219. Determination of Coating Weights on Electrolytic Tinplate. H. Liebmann, J. W. Price, and S. R. Thompson. *Journal of the Society of Chemical Industry*, v. 68, June 1949, p. 177-179.

Commercial flow-brightened tinplate was found to contain a Sn-Fe alloy at the interface of the Sn and the steel base. The extent of this layer was determined and a suitable correction is suggested for coating-weight determination. Correction is approximate and its value

may be influenced by the nature of the coating process.

8-220. On the Preparation of Hard Oxide Films with Precisely Controlled Thickness on Evaporated Aluminum Mirrors. George Hass. *Journal of the Optical Society of America,* v. 39, July 1949, p. 532-540.

Formation and properties of oxide films produced on evaporated Al mirrors at various temperatures in air and by anodic oxidation in ammonium tartrate. Applications of anodically produced films. 19 ref.

8-221. Attempts to Electrodeposit Tantalum. H. J. Seim and M. L. Holt. *Journal of the Electrochemical Society,* v. 96, July 1949, p. 43-47.

Methods from aqueous and nonaqueous solutions which are recorded in the literature. The authors found that they were unable to electrodeposit Ta from any of the baths described. Attempts to plate from numerous other aqueous and nonaqueous solutions were also unsuccessful.

8-222. The Electrodeposition of Molybdenum from Aqueous Solutions. Mary Joecile Ksycki and L. F. Yntema. *Journal of the Electrochemical Society,* v. 96, July 1949, p. 48-56.

Conditions under which deposition of metallic molybdenum was found to occur. 18 ref.

8-223. Silver-Surfacing Improves Performance of Gas Turbine Roller Bearings. Donald F. Wilcock and Frederick C. Jones. *Steel,* v. 125, July 25, 1949, p. 61-63, 100.

Studies of lubricating problems and metal transfer from separator to inner race, while rolls and outer race of bearings were operated at high speed, high load, and high temperature, revealed that silver-plating the brass separator prolongs bearing life and reduces metal transfer under poor lubricating conditions.

8-224. How to Plate Pressed Metal Powder Parts. E. A. Anderson. *Materials & Methods,* v. 30, Aug. 1949, p. 55-57.

Parts made by powder metallurgy can be successfully plated by making only relatively small changes in procedures normally used on wrought parts.

8-225. Periodic Reverse Current Plating on Die Castings. D. Gardner Foulke. *Die Castings,* v. 7, Aug. 1949, p. 41-42, 44-45.

On Zn-base die castings. Advantages of process.

8-226. (Book) **Zinc and Cadmium Plating.** 50 pages. Imperial Smelting Corp., Ltd., 37 Dover Street, London, W.1, England. 5s., net.

Protection of iron and steel against corrosion by the application of Zn and Cd electrodeposits. Applications and preparation of articles for plating, and anodes. The deposition of Zn from acid $ZnSO_4$, alkaline $Zn(CN)_2$, and Zn-Hg solutions. Bright Zn plating. Cd plating, determination of the thickness of Zn and Cd deposits and aftertreatment of the deposits.

8-227. Some Interesting Manufacturing Operations at Ascot Gas Water Heaters Ltd. (Concluded.) H. Clark and R. Wall. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1681-1684.

Techniques employed in the polishing and plating department.

8-228. A Survey of Some Specialized Aluminium Alloys for Anodic Treatment. J. F. G. Herenguel. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1739-1743.

Research on the methods of anodic treatment and on properties of the metals and alloys suitable for such treatment has led to the development of "precision" alloys intended to give a perfect finish after anodizing. Essential characteristics of these alloys. 16 ref.

8-229. Recherches sur le polissage électrolytique des aciers, du chrome et des alliages légers en vue de l'examen micrographique. (Research on Electropolishing of Steels, Chromium, and Light Alloys as an Aid to Their Micrographic Examination.) P. A. Jacquet. *Revue de Métallurgie,* v. 46, Apr. 1949, p. 214-226; discussion, p. 226-227.

New bath in which acetic anhydride is replaced by acetic acid, and perchloric acid is decreased to not more than 50 cc. per liter is easy to prepare without risk of explosion, even when handled by inexperienced personnel. Optimum conditions of operation. For the polishing of high-strength light alloys, such as Al-Zn-Mg alloys, a hot chromic-phosphoric acid solution is proposed, at 5-10 volts. 18 ref.

8-230. Betrachtungen über elektrolytische Niederschläge. (Observations on Electrolytic Deposits.) Carl E. Heussner, A. R. Balden, and L. M. Morse. *Metalloberflache,* v. 1, sec. B, Apr. 1949, p. B2-B7; May 1949, p. B21-B23; June 1949, p. B33-B37.

Various electrolytic factors affecting the structure of metal plating. 15 ref.

8-231. Über verschiedene Vergoldungsverfahren. (Concerning Different Gold Plating Methods.) Otto Loebich. *Metalloberflache,* v. 1, sec. B, July 1949, p. B55-B57.

Gold plating for ornamental color effect and for protection against corrosion.

8-232. Neue Vergoldungsverfahren. (New Gold Plating Processes.) Max Hischmann. *Metalloberflache,* v. 1, sec. B, July 1949, p. B57-B59.

Two new German patented processes for heavy hard gold plating and gold plating for color effect.

8-233. Vergoldung nach dem Exudor-Verfahren. (Gold Plating by the Exudor Process.) *Metalloberflache,* v. 1, sec. B, July 1949, p. B59-B60.

In this process, an organic diaphragm is inserted in the bath. The resulting gold deposits are said to be extremely dense and lustrous.

8-234. Die elektrolytische Abscheidung von Metallen aus komplexe Ionen enthaltenden Lösungen. (The Electrolytic Precipitation of Metals from Solutions Containing Complex Ions.) Ernst Raub and Bernhard Wullhorst. *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie,* v. 53, May 1949, p. 142-144.

Questions Glazunov and Schlötter's theory that metals precipitate from the above solutions in secondary form.

8-235. Hard Chromium Plating; Electrolytic Deposits on Light Alloys. J. I. Cordwell. *Chemical Age,* v. 61, Aug. 6, 1949, p. 191-194.

A satisfactory base, surface preparation, the acid immersion solution, composition of electrolytes. Porosity and corrosion.

8-236. An Introduction to Electrophoresis. A. H. Stuart. *Electroplating and Metal Finishing,* v. 2, Aug. 1949, p. 513-518.

The phenomenon of electrophoresis is closely allied to those of electroplating. The process is believed to be of great potential importance. Basic principles.

8-237. Control of Electroplating Solutions by Analysis and Observation. IX. The Control of Nickel Plating Solutions. II. K. E. Langford. *Electroplating and Metal Finishing,* v. 2, Aug. 1949, p. 519-523.

Control of those constituents peculiar to bright nickel solutions of the cobalt-formate type. A metallurgical method for magnesium, previously ignored in plating chemistry.

8-238. Plating Processes Open New Markets for Light Metals. Jerome L. Bleiweis. *Light Metal* Age, v. 7, Aug. 1949, p. 8-9, 18, 20.

Varied applications of plated Al and Mg. Cleaning and plating procedures, including bath recipes.

8-239. Hydrogen Embrittlement in Copper Electroplating. C. A. Zapffe and M. E. Haslem. *Plating,* v. 36, Sept. 1949, p. 906-913, 972.

Hydrogen is considerably more active in Cu plating processes than is commonly believed. Injurious embrittlement of the steel base may develop even in the complete absence of visible hydrogen evolution. Problems of low ductility of the steel and of porosity and poor adhesion of the plate should be reexamined from the standpoint of hydrogen activities. 17 ref.

8-240. Electropolishing Silver: Processes; Bath Compositions; Current Densities. W. M. Hesselberger. *Metal Industry,* v. 75, Aug. 26, 1949, p. 167-168.

Reviews recent literature.

8-241. Application de la méthode Jacquet au polissage électrolytique des maillechorts. (Application of Jacquet's Method for Electropolishing of German Silver.) M. Giroudot. *Revue de Métallurgie,* v. 46, June 1949, p. 383-386; discussion, p. 386.

Chemical composition of electrolyte and optimum operating conditions for the polishing of German silver containing 10% Ni and also with higher Ni contents and additions of Pb dispersed in the solid solution.

8-242. Laws of the Crystallization of Thin Needles of Silver. (In Russian.) K. M. Gorbunova and A. I. Zhukova. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 605-615.

Influence of various factors on the electrodeposition of needle-shaped crystals of silver from $AgNO_3$. 10 ref.

8-243. Crystallochemical and Diffusion Mechanisms of Electro-Crystallization. (In Russian.) K. M. Gorbunova and P. D. Dankov. *Zhurnal Fizicheskoi Khimii* (Journal of Physical Chemistry), v. 23, May 1949, p. 616-624.

Laws of the growth of threadlike crystals, especially of silver deposited from $AgNO_3$.

8-244. Electrolytic Tinplate — Its Production and Benefits. Samuel S. Johnston. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1962-1964. A condensation.

U. S. procedures. Two distinct systems (acid and alkaline) are distinguished. 10 ref.

8-245. Ediphone Standardized Plating Racks. P. B. Kasakove. *Iron Age,* v. 164, Sept. 22, 1949, p. 82-83.

Four standardized racks used in plating over 500 different parts made of copper, brass, steel, zinc, and aluminum.

8-246. Anodising of Aluminum Wire and Strip. N. D. Pullen. *Electroplating and Metal Finishing,* v. 3, Sept. 1949, p. 3-8.

Problems involved in the treatment of continuous lengths and principles underlying the design of commercial plant, with particular reference to domestic as well as electrical applications.

8-247. Addition Agents for Zinc Plating Solutions. *Electroplating and Metal Finishing,* v. 3, Sept. 1949, p. 9-13.

A tabular list of substances commonly added to basic Zn plating solutions to assist in production of bright deposits, to extend the bright current density range or to improve covering power at low current densities; also the more important patent claims in this field.

8-248. Efco-Udylite Bright Nickel High Chloride Solution for Zinc Base Articles. *Electroplating and Metal Finishing,* v. 3, Sept. 1949, p. 21.

Properties and composition of British patented solution.

8-249. Nouvelle détermination en absence d'oxygène du potentiel de dissolution de l'aluminium poli électrolytiquement. (A New Determination of Solution of Potential of Electropolished Aluminum in Absence of Oxygen.) Georges Chaudron, Paul Lacombe and Georges Youssov. *Comptes Rendus* (France), v. 229, July 18, 1949, p. 201-203.

Electrolytic solution potential was determined in 3% NaCl solution in the absence of oxygen (N_2 atmosphere). Apparatus, procedure and results. Effects of addition of 0.2% $HgCl_2$ to the solution.

8-250. L'oxydation anodique du ferrochrome dans une solution de soude. (Anodic Oxidation of Ferrochromium in a Solution of Sodium Carbonate.) Jean Besson and Chu Yung-Choo. *Comptes Rendus* (France), v. 229, July 18, 1949, p. 207-209.

Two specimens (29.2 and 32.4% Fe, and 60.0 and 63.9% Cr) were used. Anodic oxidation resulted in formation of chromate under the conditions of experiment, followed by formation of a more or less adherent film of iron oxide on the anode.

8-251. Electrode Potentials of Mechanically Treated Metal During Anodic Dissolution. (In Russian.) G. S. Vozdvizhenskii and V. A. Dmitriev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 11, 1949, p. 227-229.

The problem was investigated for copper. Results clearly show the influence of structural changes of the metal surface during working on the electrode potentials of such surfaces.

8-252. Drop Forge Dies. S. L. Scheier and R. E. Christin. *Metal Progress,* v. 56, Oct. 1949, p. 492-494.

Advantages of hard chromium plating drop hammer forging dies. Types that can be plated at a savings.

8-253. Electroplating With Solder. L. H. Seabright. *Metal Progress,* v. 56, Oct. 1949, p. 509-510.

Electroplating Pb-Sn alloy on small parts facilitates subsequent soldering.

8-254. Anodic Oxide Coating Formation on Aluminium Alloys. W. N. Bradshaw and S. G. Clarke. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 147-166; discussion, p. 167-170.

Results on anodizing a range of alloys under conditions of the D.T.D. Specification 910, with special reference to weight of coating, attack on the metal, density, and microporosity of the coating and stress in its formation. Some results of the chemical M. B. V. process are given. 10 ref.

8-255. Baths for Copper Plating. M. J. Salauzie. *Engineers' Digest,* v. 10, Sept. 1949, p. 311-313. Translated and condensed from *Bulletin de la Société Francaise des Electriciens,* ser. 6, v. 9, Jan. 1949, p. 23-30.

Advantages and disadvantages of commonly used baths. Modernization of the cyanide bath, bath designed to replace the cyanide baths, and baths to replace $CuSO_4$.

8-256. Electrochemical Cleaning of a Large Steel Casting—An Experiment. John A. Wettergreen. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 486-490; discussion, p. 490-491.

Previously abstracted from *American Foundryman.* See item 7b-81, 1948.

8-257. Coordination Compounds in the Electrodeposition of Chromium. R. W. Parry, Sherlock Swann, Jr., and John C. Bailar, Jr. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 507-518; discussion, p. 518.

Previously abstracted from Preprint 92-27. See item 8-165, 1947.

8-258. A Semi-Quantitative Method for Measuring the Ductility of Chromium Electrodeposits. M. R. J. Wyllie. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 519-536.

Previously abstracted from Preprint 92-5, 1947. See item 8-158, 1947.

8-259. A Theory for the Mechanism of Chromium Plating; A Theory for the Physical Characteristics of Chromium Plate. Cloyd A. Snavely. *Transactions*

of the Electrochemical Society, v. 92, p. 537-576; discussion, p. 576-577.
Previously abstracted from Preprint 92-35. See item 8-61, 1948.

8-260. The Principles and Scientific Applications of the Electrolytic Polishing of Metals. P. A. Jacquet. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 3-14; discussion, p. 43-55.
Previously abstracted from *Sheet Metal Industries.* See item 7-410, 1947.

8-261. Technical Applications of Electrolytic Polishing. R. E. Halut. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 15-24; discussion, p. 43-55.
See previous abstract from *Sheet Metal Industries,* item 8-13, 1948.

8-262. Some Special Applications of Electrolytic Polishing. H. C. J. de Decker, A. P. Krijff, and J. M. Pluut. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 25-32; discussion, p. 43-55.
Previously abstracted from *Sheet Metal Industries.* See item 7-466, 1947.

8-263. Electrolytic Polishing of Brass Pressings. P. Berger. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 33-40; discussion, p. 43-55.
Previously abstracted from *Sheet Metal Industries.* See item 7-505, 1947.

8-264. Silverplating in Australia. H. E. Arblaster. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 71-76; discussion, p. 103-108.
Cyanide baths containing the usual double cyanide of Ag and K, free KCN and K_2CO_3 are used for the electrodeposition of Ag.

8-265. German Electroplating Practice. A. W. Wallbank. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 83-90; discussion, p. 103-108.
Tours were made of Western Germany after V.E. Day. Findings of the investigations were originally published as B.I.O.S. Reports.

8-266. Factors Affecting the Internal Stress in Electrolytically Deposited Copper. J. Van Der Sommen. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 95-98; discussion, p. 103-108.
Method for measuring internal stress in electrodeposited metals. Influence of base metal; surface condition; pretreatment of the Cu solution, acid content and Cu content; metallic ions; and organic additions in the Cu solution.

8-267. Porous Chrome Plating of Cylinder Bores by the Van Der Horst Method. C. D. B. Williams. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 99-101; discussion, p. 103-108.
See previous abstract from *Engineering,* item 8-48, 1948.

8-268. The Effect of Operating Conditions on the Throwing Power of Cyanide Cadmium Plating Solutions. P. Baeyens. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 109-112; discussion, p. 151-155.
Limits of temperature and current density for high throwing power.

8-269. Heavy Nickel Depositions as a Manufacturing Operation. S. Wernick and F. Willetts. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 113-120; discussion, p. 151-155.
Previously abstracted from *Metal Finishing.* See item 8-242, 1948.

8-270. Alloy Deposition From Sulphamate Baths. R. Piontelli and L. Canonica. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 121-125; discussion, p. 151-155.
Results of experiments on Ni-Co, Pb-Sn, and Cd-Zn alloys. Baths based on salts of sulfamic acid (NH_2SO_3H).

8-271. Electrodeposition of Metallic Coatings on Magnesium Alloys. R. R. Rogers and M. L. Boyd. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 127-130; discussion, p. 151-155.
Previously abstracted from *Sheet Metal Industries.* See item 8-116, 1948.

8-272. The Electrodeposition of Tungsten Alloys Containing Iron, Nickel and Cobalt. Abner Brenner, Polly Burkhead, and Emma Seegmiller. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 131-146; discussion, p. 151-155.
Previously abstracted from the *Journal of Research of the National Bureau of Standards.* See item 8-172, 1947.

8-273. Experiences With the Rochelle Copper Plating Solution. N. A. Tope. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 147-150; discussion, p. 151-155.
Plating conditions, blistering troubles, influence of anode area, and exact influence of pH value.

8-274. The Influence of the Basis Metal

in Electroplating. R. Piontelli. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 157-163; discussion, p. 209-213.

Previously abstracted from *Sheet Metal Industries.* See item 8-180, 1947.

8-275. The Mechanism of Exfoliation of Electrodeposited Surfaces. A. T. Steel. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 165-177; discussion, p. 209-213.

Reactions of surfaces to various physical and chemical treatments.

8-276. The Structure of Thick Chromium Electrodeposits. J. J. Dale. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 185-194; discussion, p. 209-213.

See previous abstract from *Sheet Metal Industries,* item 8-83, 1948.

8-277. The Brightening Action of Organic Sulphonates in Bright Nickel Plating. G. E. Gardam. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 203-207; discussion, p. 209-213.

Previously abstracted from *Sheet Metal Industries.* See item 8-108, 1948.

8-278. The Role of Cathode Potential in Electrolytic Alloy Deposition: Experiments on Copper-Zinc Alloys. T. Banerjee. *Proceedings of the Third International Conference on Electrodeposition,* 1948, p. 195-201; discussion, p. 209-213. 19 ref.

Data on the deposition of brass. Influence of the Cu:Zn ratio in the electrolyte, concentrations of NaCN, caustic soda, Na_2CO_3, NH_3, and $NaHCO_3$; pH of the solution and effects of addition agents, current density, temperature, and agitation. 19 ref.

8-279. The Mechanism of Electrode Processes in Aqueous Solutions. A. Hickling. *Quarterly Reviews,* v. 3, no. 2, 1949, p. 95-125.

122 references.

8-280. A Report on Recent Research in Electrolytic Polishing. P. Michel. *Sheet Metal Industries,* v. 26, Oct. 1949, p. 2175-2189.

Theory, different polishing baths and their testing, factors influencing polishing, after-treatment of polished pieces, macrostructure of the surfaces, mounting arrangements and anode and cathode assemblies for differently shaped pieces. (To be continued.)

8-281. The Electrodeposition of Molybdenum Alloys. H. J. Seim and M. L. Holt. *Journal of the Electrochemical Society,* v. 96, Oct. 1949, p. 205-213.

New aqueous citrate plating bath for electrodeposition of alloys of Mo with Co, Fe, and Si. Experimental results show effect of bath pH, concentration of sodium molybdate, and cathode current density on performance. 19 ref.

8-282. A High-Efficiency Anode for Alkaline Tin-Plating. The Effect of Alloying Constituents on the Anodic Behavior of Tin in Alkaline Stannate Solutions. Frederick A. Lowenheim. *Journal of the Electrochemical Society,* v. 96, Oct. 1949, p. 214-225.

By incorporating up to about 1% Al in the tin anodes used in alkaline tin plating, current densities obtainable can be markedly increased. The effect of 26 elements upon the anode behavior of tin in alkaline solutions. Many have little effect; some, such as Ni, Ag, Cd, and In, have a strong passivating action. 10 ref.

8-283. Über die Porosität und Bildungsgeschwindigkeit von Elektrophosphatschichten. (Porosity and Formation Rate of Electrophosphate Films.) W. Machu. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 278-281.

Proves that a.c. treatment accelerates the bonderizing action even in baths which already contain powerful accelerators. The slightly greater porosity of electrophosphate films is explained and it is suggested that such films may have a greater protective effect than other types. 14 ref.

8-284. Manganphosphatschichten aus dem Kurzzeitbad. (Manganese Phosphate Films From the "Short-Time" Bath.) W. Machu. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 283-286.

The rate of formation and porosity of phosphate films produced by NO_3-containing Mn-phosphate baths was investigated by an electrochemical method. Results show that a fresh bath will result in greater porosity than a used bath. Treating the bonderized metal in a chromate bath further increases its already good corrosion resistance.

8-285. (Book) **Proceedings of the Third International Conference on Electrodeposition.** 219 pages. 1948. The Electrodepositors' Technical Society, 27 Islington High St., London, N.1, England. £2, 10s. to nonmembers.

Twenty-three papers, separately abstracted.

8-286. Metallurgy and Electroplating. Harold J. Read. *Mineral Industries* (Pennsylvania State College), v. 19, Oct. 1949, p. 1, 3-4.

Unsolved practical and fundamental problems in electroplating requir-

ing metallurgical research for their solution.

8-287. Electrolytic Polishing in Cyanide Solutions. *Electroplating and Metal Finishing,* v. 3, Oct. 1949, p. 48-51.

Process applicable to the treatment of Ag, Cu, Cd, alloys consisting of these metals, brass, bronze, Zn, and Ni-Ag. The applied voltage is caused to fluctuate between certain limits instead of being held constant.

8-288. Plating Zinc and Zinc Alloys. *Electroplating and Metal Finishing,* v. 3, Oct. 1949, p. 54-56.

Pretreatment, degreasing, and neutralization. Copper, brass, Ag, Ni, Cr, and bright Zn plating.

8-289. Une nouvelle méthode pour la mesure de l'adhésivité des revêtements électrolytiques. (A New Method for Measurement of the Adhesivity of Electrodeposits.) M. Bonnemay. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 7, 1948, p. 156-160.

After a critical study of three well-known methods, it was concluded that none are entirely satisfactory. A new mechanical method was developed.

8-290. Das anodische Polieren. (Anodic Polishing.) Kurt Schmidt and Otto Kahl. *Zeitschrift des vereines Deutscher Ingenieure,* v. 91, Aug. 15, 1949, p. 389-390.

Electrolytes, currents, temperatures, and other conditions required for anodizing iron and steel. The differences between "luster" and "smoothness". 22 ref.

8-291. Die elektrolytische Abscheidung von Metallen aus komplexe Ionen enthaltenden Lösungen. (The Electrolytic Precipitation of Metals From Solutions Containing Complex Ions.) E. Raub and B. Wullhorst. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 323-328.

Previously abstracted from *Zeitschrift für Elektrochemie und angewandte Physikalische Chemie.* See item 8-234, 1949.

8-292. Influence of Current Density, Distance Between Electrodes, and Temperature on Ratio of Actual Product to Theoretical During Electrolysis of Cadmium Chloride. (In Russian.) G. A. Abramov and A. A. Kostyukov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, June 1949, p. 578-585.

The equations relating above ratio to current density, distance between electrodes, and to temperature are applicable to electrolysis of cadmium chloride. 14 ref.

8-293. Protective-Decorative Nickel Plating Without Subsequent Polishing. (In Russian.) N. T. Kudryavtsev, O. M. Korolkova, and V. V. Fedurkin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, June 1949, p. 586-591.

It was found that the distinguishing characteristic of the electrolyte for bright nickel plating is the presence of a small amount of potassium or sodium salts of naphthalene disulfonic acid. Other components have the same purpose as in standard nickel plating. This electrolyte operates at a high pH (6.3) and in a wide temperature interval (20-45° C.) and range of current density. Optimum method of plating. 10 ref.

8-294. Conditions for Electrodeposition of a Mn-Ni Alloy. (In Russian.) D. N. Gritsan and N. S. Tsvetkov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, June 1949, p. 600-604.

Possibility of simultaneous deposition of Mn and Ni from sulfate solutions in the presence of ammonium salts. Influence of salt concentration, cathode current density, and pH on content of Mn in the electrodeposit.

8-295. Estimating Plating Time. Tyler G. Hicks. *American Machinist,* v. 93, Nov. 3, 1949, p. 235.

Nomographic chart is clarified by two numerical examples.

8-296. The Chemistry of Copper-Zinc Alloy Plating Baths. A. Kenneth Graham. *Plating,* v. 36, Nov. 1949, p. 1120-1126.

First of a series of articles on brass and "bronze" plating, which will include discussions of both high and low-speed plating. The chemistry of the Cu-Zn baths determines their rather unusual behavior in the plant. Novel recommendations for preparation of new baths.

8-297. Effect of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions. 3. Purification of Solutions, Methods of Operations, and Testing of Deposits. D. T. Ewing, Robert J. Rominski, and William M. King. *Plating,* v. 36, Nov. 1949, p. 1137, 1140-1145.

Appearance, adhesion, salt-fog corrosion resistance, ductility, and hardness. Throwing power and current efficiency of the plating baths. Practical methods for evaluation of physical properties.

8-298. How To Avoid Electroplating Equipment Failures Due to Stray Currents. E. C. Reichard. *Products Finishing,* v. 14, Nov. 1949, p. 26-28, 30.

Recommendations.

8-299. Aluminum: Its Surface Preparation and Finishing. Part II. Electroplating on Aluminum. E. R. Yarham. *Products Finishing,* v. 14, Nov.

1949, p. 40, 42, 44, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66.

Recommended procedures including preliminary surface preparation.

8-300. Barrel Plating to Specification. A. W. Wallbank. *Journal of Electrodepositors' Technical Society,* v. 24, 1949, p. 181-193. (Preprint.)

Lack of understanding of surface area of load and resulting low current densities. Thickness determination, barrel design, plant layout, process control, costs, and prices.

8-301. French Electroplating Practice; The Modern Plant of the Japy Works at Arcueil (Seine). *Metal Industry,* v. 75, Oct. 14, 1949, p. 330-332.

8-302. Estimating Plating Finish Weight. Tyler G. Hicks. *American Machinist,* v. 93, Nov. 17, 1949, p. 139.

Use of nomograph is illustrated by numerical examples.

8-303. The Structure of Electrodeposits; A Review of the Present State of Knowledge. J. J. Dale. *Metal Industry,* v. 75, Oct. 21, 1949, p. 355-357; Nov. 4, 1949, p. 394-395.

8-304. Potential of Nickel in Solutions of Nickel Electrolytes. (In Russian.) B. V. Drozdov. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, July 1949, p. 716-723.

Potentials of pure active and inactive nickel in Ni salt solutions were measured. Influence of individual components. Data are charted for Cu and Mn additions. Influence of pH on potential was determined.

8-305. (Book) **The Principles of Electrodeposition. Ed. 2.** Samuel Field. 340 pages. 1949. Sir Isaac Pitman and Sons, Ltd., 39 Parker St., Kingsway, London, W.C.2, England.

Qualitative and quantitative electrolysis, properties of gases and solutions, electrolytic conductance, thermochemistry, electrode potentials, accumulators, hydrogen-ion concentration, electrode reactions, throwing power, separation and codeposition of metals, addition agents in electrodeposition, strong electrolytes, and bipolar electrodes.

8-306. Improved Plating and Corrosion Protection to Result From New Developments Revealed at Electrochemical Society Meetings. *Steel,* v. 125, Nov. 21, 1949, p. 82-85, 117-118, 120.

Extended abstracts of a number of papers presented at 96th annual meeting. X-ray method for determining thickness of tin coating on steel; recent advances in tin, chromium, and alloy plating; and various corrosion processes.

8-307. The Physical and Engineering Properties of Electrodeposited Metals. J. S. Anderson. *Electroplating and Metal Finishing,* v. 3, Nov. 1949, p. 84-91.

Engineering applications of electrodeposits: decorative surfaces; protection of base metals from corrosion; plating for increased surface hardness and for reclamation; stress in electrodeposits; hydrogen embrittlement; improved bearing properties; modified electrical and thermal properties; improved luster and reflectivity; alloy plating. 18 ref.

8-308. Electroplated Coatings for Corrosion Protection. A. G. Sussex. *Electroplating and Metal Finishing,* v. 3, Nov. 1949, p. 97-99, 102.

Corrosion promoting and controlling factors, corrosion of electroplated metal components, corrosion protection by typical electroplated coatings, and role of alloy plating in protection. 32 ref.

8-309. The Proper Application of Electrolytic Polishing to Metal Finishing. C. E. Gardam. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 146-148.

Compares mechanical and electropolishing—advantages and disadvantages of the two processes. Prospects of electropolishing for the future.

8-310. Sur les dangers d'explosion des bains acétoperchloriques de polissage électrolytique. (Concerning Explosion Hazards of Acetic-Perchloric Baths Used in Electropolishing.) L. Médard, P. A. Jacquet, and R. Sartorius. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 549-560.

A diagram of the ternary system of perchloric acid, acetic anhydride, and water clearly indicates the explosive, inflammable, and safe areas.

8-311. Verkupferung aus dem Pyrophosphatbad. (Copper Plating From the Pyrophosphate Bath.) *Metalloberfläche,* v. 1, sec. 3, Sept. 1949, p. B91.

A patented method. Data on suitable bath compositions.

8-312. Kann man das Cyankalium in galvanischen Bädern durch Cyannatrium ersetzen? (Can Potassium Cyanide in Galvanic Baths by Replaced by Sodium Cyanide?) *Metalloberfläche,* v. 1, sec. B, Sept. 1949, p. B92.

With the exception of gold baths with soluble gold anodes, both theory and practice permit use of NaCN in place of KCN in galvanic baths without any undesirable effects.

8-313. Production-Line Plating Aluminum. *Steel,* v. 125, Dec. 5, 1949, p. 94-97; 116, 118, 121.

Equipment and procedures. Cleaning and conditioning solutions. Bath compositions.

8-314. Electrodeposited Coatings for Atmospheric Corrosion Protection. Fielding Ogburn. *Product Engineering,* v. 20, Dec. 1949, p. 135-139.

Products made of steel or Zn-base die castings are effectively protected against atmospheric corrosion by electroplated coatings of Zn, Cd, Ni, Cr, Cu, and several other metals. Length and quality of protection depend on type of atmospheric corrosion, coating and base metal.

8-315. Electrolytic Tinplate; Its Production and Benefits. Samuel S. Johnston. *Plating,* v. 36, Dec. 1949, p. 1233-1235.

10 references.

8-316. Airplane Propeller Production. *Plating,* v. 36, Dec. 1949, p. 1228-1232.

Surface preparation, plating, and other finishing procedures.

8-317. The Strength and Ductility of Electrodeposited Metals. I. The Hydraulic Bulge Test. Thomas A. Prater and Harold J. Read. *Plating,* v. 36, Dec. 1949, p. 1221-1226.

Test method and apparatus; interpretation of results. (To be continued.)

8-318. Trouble Shooting in the Plating Room. Richard B. Saltonstall. *Plating,* v. 36, Dec. 1949, p. 1216-1220.

Difficulties in new installations: poor adhesion, pitting, roughness, streaks and blotchy areas, poor corrosion resistance, and their causes and remedies.

8-319. Plating Impurities Removed Automatically. *Steel,* v. 125, Dec. 12, 1949, p. 118.

Self-cleaning filter system for complete removal of solid impurities in continuous or intermittent operation developed for permanent installation in electroplating and other processing setups.

8-320. Cathodic Passivation and Structures of Electrolytic Precipitates in Solutions of Simple and Complex Salts. (In Russian.) A. T. Vagramyan and Z. A. Solov'eva. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 321-324.

Polarization curves obtained from precipitation of Ag from $AgNO_3$ under different conditions. The purpose of the investigation was to determine conditions for production of fine-grained precipitates from simple salts.

8-321. Causes of Blistering of Electrodeposits on Zinc Alloy Die Castings. S. Wernick, H. H. Symonds, and H. C. Castell. *Journal of Electrodepositors' Technical Society,* v. 24, 1949, p. 195-210. (Preprint.)

Characteristics of service and process blisters. Main causes and some preventive measures. 16 ref.

8-322. Automatic Plating Plant Design. A. Smart. *Metal Industry,* v. 75, Nov. 18, 1949, p. 433-435; Dec. 2, 1949, p. 476-478.

8-323. Potassium Stannate for Tin Plating. F. A. Lowenheim. *Wire and Wire Products,* v. 24, Dec. 1949, p. 1117-1120.

Use of potassium stannate in place of sodium stannate permits attainment of much higher plating speeds while retaining all the advantages of the alkaline stannate solution. General characteristics of the solution and suggestions for its use. 11 ref.

8-324. Uniform Electrolytic Tin Plate Coats Assured by New Plating Thickness Meter. *Steel,* v. 125, Dec. 19, 1949, p. 108.

New instrument which continuously indicates and records tin coating thickness on steel strip during the plating operation.

SECTION IX

PHYSICAL and MECHANICAL TESTING

9-1. Fatigue Testing of Wire. F. A. Votta, Jr. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1117-1123.

See abstract of paper from *Iron Age,* item 9a-65, 1948.

9-2. Effect of Fatigue on Tension-Impact Resistance. William H. Hoppmann, II. *ASTM Bulletin,* Dec. 1948, p. 36-38.

Previously abstracted from *American Society for Testing Materials, Preprint* 1948. See item 9a-42, 1948

9-3. Measuring Creep With Strain Gages. *Iron Age,* v. 162, Dec. 23, 1948, p. 59.

New technique reported by the Canadian Bureau of Mines.

9-4. Gray Iron Transverse Test Bars. (Concluded.) Jack H. Schaum. *Foundry,* v. 77, Jan. 1949, p. 82-85, 222.

Methods of producing and testing developed at Naval Research Laboratory, Washington.

9-5. Determination of Yield Point During Bending and Torsion. (In Russian.) N. N. Davidenkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1233-1237.

Analyzes the above on the basis of the assumption of two conditional yield points during bending and torsion—one real, and the other nominal. Formulas and diagrams are proposed, permitting calculation of the influence of residual stresses on the residual deformation.

9-6. Bending Tests on Disks Supported on Their Periphery. (In Russian.) Ya. B. Fridman and I. M. Roitman. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1238-1240.

This type of test characterizes the mechanical properties of high-strength metals better than tensile and bending tests on flat specimens.

9-7. Method of Testing the Durability of Corrosion Resistant Coatings on Steel Under Alternating Stresses. (In Russian.) A. N. Mitinskii and E. S. Reinberg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1247-1250.

A fatigue-test machine applicable to the above. Method of testing and results obtained.

9-8. Determination of Tangential Stresses in Round Rods and Tubes Under Plastic Torsion. (In Russian.) N. F. Lashko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1251-1254.

Proposes a series of equations for calculation of the above. Graphic interpretation of these formulas, for different ferrous and nonferrous metals. Influence of several factors, such as composition and method of heat treatment.

9-9. Horizontal Materials-Testing Machine. (In Russian.) S. E. Khanin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1269-1271.

A newly developed apparatus which may be applied to the study of deformation and to the determination of tensile, compressive, and bending stresses.

9-10. Apparatus for Mechanical Testing of Locomotive and Other Piston Rings. (In Russian.) P. G. Korolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1271.

A newly developed apparatus which permits determination of elastic and residual deformation during application of a concentrated force.

9-11. All-Electronic Testing Machine. *Machine Design,* v. 21, Jan. 1949, p. 140-141.

Designed primarily for low-capacity research work, the tester utilizes electronic control of the loading, force-measuring, and strain-measuring systems. Capable of applying loads up to 5000 lb., the machine is nevertheless sensitive within 0.1%.

9-12. Stress-Strain Relations for Uniaxial Loading. J. H. Palm. *Applied Scientific Research,* v. Al, No. 3, 1948, p. 198-214.

Mathematical expressions for the above, as proposed by Ludwik and Hollomon. It is shown that these empirical formulas cannot agree with the essential behavior of a metal during uniform straining. The existence of one and the same stress-strain relation for uniform uniaxial tension and compression is emphasized. A mathematical expression can be derived which essentially agrees with the experimentally determined stress-strain relation. 10 ref.

9-13. World's Most Powerful Universal Testing Machine. *Baldwin,* v. 4, 3rd and 4th qtr., 1948, p. 9-13.

The 5,000,000-lb tension-compression machine recently installed at the Philadelphia Naval Base of the U. S. Navy, its operation, and applications.

9-14. Draw Tools for Single-Action Presses. J. W. Lengbridge. *Tool Engineer,* v. 22, Jan. 1949, p. 33-36.

Installment No. 8 of a series on the theory and practice of pressing aluminum.

9-15. Ein einfacher Mikrohärteprufapparat mit vielen praktischen Verwendungsmöglichkeiten. (A Simple Microhardness Tester With Many Practical Application Possibilities.) E. B. Bergsmann. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 294-299.

A rather new method of hardness testing.

9-16. Verschleissprufung von Hartchromschichten. (Testing the Wear Resistance of Hard Chromium Plating.) Hans Wahl and Karl Gebauer. *Metalloberfläche,* v. 2, Feb. 1948, p. 25-37.

Study of different types of wear under various conditions, including the effect of temperature, current density, and nature of the electrolyte on the hardness and wear resistance of chromium plating. Test data, and method of testing.

9-17. Measuring the Hardness of Metals. *Tool & Die Journal,* v. 14, Jan. 1949, p. 61-62, 64, 66, 76.

Various standard methods and apparatus.

9-18. Zugfestigkeitswerte von Umschmelzaluminium-Gusslegierungen in Abhängigkeit vom Querschnitt. (Effect of Cross Section on the Tensile Strength of Cast Aluminum Alloys Produced From Scrap.) August Buckeley and Armin Einenkel. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 28-32.

Experimental determination. Type of tensile test piece used.

9-19. Bemerkung zur Temperaturabhängigkeit der Schlagbiegefestigkeit von Zinklegierungen. (Remarks Concerning the Temperature Dependence of the Impact Strength of Zinc Alloys.) Friedrich Erdmann-Jesnitzer and Wilhelm Hofmann. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 65.

A criticism of the impact-bending and notch impact tests reported by N. Ludwig in recent German publications. A temperature-impact curve shows the authors' results.

9-20. Beitrag zur Frage der Definition der Dauerstandfestigkeit von Leichtmetall-Legierungen. (A Contribution to the Problem of Determining the Fatigue Strength of Light-Metal Alloys.) Hugo Vosskuhler. *Zeitschrift fur Metallkunde,* v. 39, Mar. 1948, p. 79-87.

Long and short-time tests made in the range 30-150° C. on a variety of Al and Mg alloys. 14 ref.

9-21. A New Micro-Hardness Tester. Paul Ramsthaler. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 207-211. Translated from the German.

Instrument developed in Germany, 1940-1942.

9-22. Comparison of Notch Tests and Brittleness Criteria. C. J. Osborn, A. F. Scotchbrook, R. D. Stout, and B. G. Johnston. *Welding Journal,* v. 28, Jan. 1949, p. 24s-34s.

Progress Report No. 1 from Lehigh University on the effect of fabrication processes on steels used in pressure vessels. Results of a comparison of different test methods, on the basis of which the procedure to be used in the main program was determined.

9-23. Use of Hardness Data Restricted. A. R. Troiano. *Steel,* v. 124, Jan. 17, 1949, p. 66-71.

Limitations of the end-quenched hardenability test as a means of comparing various steels are discussed in connection with an X-ray diffraction study of retained austenite in Jominy test bars and austenite transformation diagrams for steels SAE 5140, 2340 and T1340. Structural variations may exist which are not evident from hardness data alone. Includes graphs, tables, and photomicrographs. 14 ref.

9-24. Apparatus for Tensile Testing at Sub-Zero Temperatures. E. J. Ripling and G. Tuer. *Product Engineering,* v. 20, Jan. 1949, p. 103-105.

Apparatus is designed to be used in conjunction with a special fixture to produce a maximum eccentricity of less than 0.002 in. in loading.

9-25. Bonded Resistance Wire Gages for Strain Measurements. Arthur C.

Ruge. *Product Engineering,* v. 20, Jan. 1949, p. 116-117.

Six setups for uniaxial and four for biaxial stresses.

9-26. A Method of Fitting the Andrade Creep Equation to Experimental Results. A. J. Kennedy. *Proceedings of the Physical Society,* v. 61, Dec. 1, 1948, p. 510-515.

A method by which the constants in the above fromula for the flow of metals under constant stress can be rapidly deduced from experimental results by direct reading from a system employing sliding templates of calculated shape. The general equation to which the method is applicable is derived.

9-27 (Book). **Evaluation of Residual Stress.** K. Heindlhofer. 196 pages. 1948. McGraw-Hill Book Co., Inc., 330 West 42nd St, New York 18. $4.00.

Intended as a text for graduate students in mechanical engineering and metallurgy or as a reference book. The commercial importance of residual stresses in metals; limitations of stress analysis imposed by anisotropy; pertinent phases of theory of elasticity and mapping of stresses; methods and apparatus for residual-stress determination. The concluding chapter describes certain examples.

9-28 (Book). **The Strength of Light Alloy Struts.** J. F. Baker and J. W. Roderick. 148 pages. 1948. Aluminium Development Assn., 33 Grosvenor St., London W.1, England. 21s. net.

Results of experimental investigation conducted since 1944. Theory; properties of material affecting strut failure; strut tests on extruded sections; and summary and conclusions. The greater part is a description of test methods, a discussion of tests, and an analysis of test results.

9-29. The Determination of Stresses in Plastic Regions in Problems of Plane Flow. P. S. Symonds. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 107-112.

A simple numerical-graphical method is applied to determine stresses in plastic zones near elliptic free boundaries. The yield load of a tensile bar containing elliptic notches is obtained for a series of notches of varying sharpness. Some related problems.

9-30. Calibration of Testing Machines With a Proving Ring. R. C. A. Thurston and Samuel Goldberg. *Metal Progress,* v. 55, Jan. 1949, p. 59-60.

In two separate communications, the first author refers to D. H. Rowland's article in the Sept. issue, and proposes use of a standard medical stethoscope instead of the more expensive equipment proposed by Rowland. The second author recommends attachment of an auxiliary thumb screw to the micrometer to increase accuracy.

9-31. Mechanical Testing of Arc Welds. *Metal Progress,* v. 55, Jan. 1949, p. 64B.

A data sheet based on the joint specifications of AWS and ASTM. Includes information on the following types of arc welding electrodes: mild steel, low-alloy steel, corrosion resisting chromium and chromium-nickel steel, copper, and a copper alloy.

9-32. Etude critique des mesures de dureté et de microdureté. (Role du polissage électrolytique). (Critical Study of the Determination of Hardness and Microhardness. Role of Electrolytic Polishing.) Michel Mouflard. *Métaux & Corrosion,* v. 23, Nov. 1948, p. 245-254.

Different methods for the above and factors influencing accuracy. Data indicate that macro- and microhardness have different spheres of application. The first gives a general idea of hardness independent of the state of the surface; the second requires particularly careful surface preparation and indicates the slightest heterogeneity of the investigated materials. 14 ref.

9-33. Micro-Hardness Testing. E. Borje Bergsman. *British Chemical Digest,* v. 3, Jan. 1949, p. 101. Reprinted from *Anglo-Swedish Review,* Nov. 1948.

Instrument developed in Sweden can be used both for static indentation tests and for scratch tests with the same diagonal indenter.

9-34. Impact Strength of Metals at −253° C. (In Russian.) V. I. Kostenets, B. G. Lazarev, V. I. Khotevich, and M. G. Shikhman. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1149-1155.

Method for rapid determination of impact strength at the temperatures of liquid nitrogen (−196° C.) and liquid hydrogen (−253° C.). Data for a copper and two brasses.

9-35. Les essais de fluage et leurs enseignements pour la construction des turbines a gaz. (Creep Testing and its Results as Applied to the Design of Gas Turbines.) W. Siegfried. *Revue de Métallurgie,* v. 45, Oct. 1948, p. 361-373; discussion, p. 373.

Different methods of creep testing. Results indicate that the most accurate data are obtained by long-time creep testing of simple and notched specimens.

9-36. Le fluage et la relaxation a froid des fils d'acier tréfilés. (Creep and Relaxation of Drawn Steel Wires at Room Temperature.) Robert de Strycker. *Révue de Métallurgie,* v. 45, Oct. 1948, p. 411-414; discussion, p. 414.

A new method for determination of the above. Only long-time testing will indicate true mechanical properties of such wires.

9-37. Construction of Ballistic Impact Test Machines. (In Russian.) G. P. Zaitsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1356-1365.

Reviews theoretical bases of the above and presents comparative estimation of parasitic energy losses as compared to usual impact-test machines.

9-38. Analysis of Certain Characteristics of the Mechanical Properties of Metals at High Temperatures. (In Russian.) I. A. Oding. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1365-1377.

Existing methods for determination of the above.

9-39. Diagrams of Elongation and Contraction Under the Dynamic Application of Stresses. (In Russian.) P. G. Kirillov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1377-1379.

Proposes a new indirect method for determination of rate of deformation, acceleration, and applied stress in dynamic testing, consisting of the recording of a periodically vibrating beam of light on a moving plate.

9-40. Method of Testing Brittle Materials. (In Russian.) L. V. Abanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p.1400.

A specially developed apparatus. A drawing indicates the basic principles of operation.

9-41. Apparatus for Recording Rate of Deformation of Metal Under Impact Stress. (In Russian.) V. F. Loshkarev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1401-1403.

A detailed description of the above, based on the use of optical recording.

9-42. A New Tyre, Brake and Undercarriage Testing Machine. J. R. Green and H. A. Wills. *Aircraft Engineering,* v. 21, Jan. 1949, p. 22-24.

Rig designed and built in Australia for testing of individual components or complete units within a static wheel load of 2500-50,000 lb. and with a maximum overal height of 10 ft.

9-43. Standard Bolt and Nut Tests Aid Both Makers and Users. W. N. Boyd. *Steel,* v. 124, Feb. 7, 1949, p. 97-99, 132.

New series of tension, elastic-proof-load, yield-strength, plastic-deformation, hardness, head, and stripping test procedures devolped by American Institute of Bolt, Nut and Rivet Manufacturers.

9-44. Fracture Characteristics of Ship Plate in Certain Small-Scale Tests. E. P. Klier, F. C. Wagner, and M. Gensamer. *Welding Journal,* v. 28, Feb. 1949, p. 50s-66s.

The slow-bend notch-bar test was used and two notch radii were studied. Results of edge notched bar tensile tests. Reference to Davidenkov's theory of failure. 14 ref.

9-45. Axial Tension Impact Tests of Structural Steels. W. H. Bruckner and N. M. Newmark. *Welding Journal,* v. 28, Feb. 1949, p. 67s-80s; discussion, p. 80s-88s.

Tests were made on a number of steels using notched specimens of various types. A standard specimen was developed, and tests were run at a number of different values of initial energy of the pendulum. Transition temperatures were determined from both energy absorption and reduction in area, with same results. Results indicate that the axial tension-impact test gives fundamental and reliable information regarding notch sensitivity.

9-46. The Determination of the Separate Stresses in Three-Dimensional Stress Investigations by the Frozen Stress Method. H. T. Jessop. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 27-31.

How an extension of the Lamé-Maxwell equations to three dimensions can be used in conjunction with "frozen stress" observations for the above.

9-47. A Simple Constant Stress Creep Test. J. C. Fisher and R. P. Carreker. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 178.

Method for obtaining constant stress which is especially suited to the testing of small wires, but may easily be extended to rods of any diameter.

9-48. Stroke of Fatigue Tester Is Varied Automatically. *Product Engineering,* v. 20, Feb. 1949, p. 90-91.

Constant force fatigue-testing machine built by Baldwin Locomotive Works.

9-49. Some Physical Characteristics of the Wire-Resistance Strain Gauge. Eric Jones. "Measurement of Stress

and Strain in Solids," *Institute of Physics,* 1948, p. 1-26.

The flat-grid, the saw-tooth, and the woven type; behavior under strain; behavior of matrix and adhesive layer; effect on sensitivity of imperfect adhesion; effect of incomplete adhesive polymerization; effect of humidity; effect of change of resistance of ground connection; waterproofing methods; effect of temperature on resistance; current-carrying capacity; optimum resistance value; effect of temperature on strain sensitivity and on creep under load; "drift" in strain-gage indications; range of linearity and mechanical breakdown; setting time and hysteresis; fatigue under repeated loading; and limits of frequency response.

9-50. The Use of Resistance Strain Gauges in Combination, With Particular Reference to the Measurement of Component Loads. F. Aughtie. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 27-41.

How the necessary circuit can be derived, particularly for the purpose of load measurement. Not concerned with solution of elastic problems which may be involved.

9-51. High-Frequency Strain Gauges. E. P. George. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 42-48.

The change of resistance of ferromagnetic wires under tension was found to be much greater if the measurements were performed using high-frequency alternating current than if direct current was used. Possible application of this phenomenon to increasing the sensitivity of strain gages.

9-52. A Note on the Use of Resistance Strain Gauges in Ships. F. B. Bull. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 49.

Use in connection with study of the relative behavior of welded and riveted ships' structures.

9-53. A Review of Some Recent Developments in Photoelasticity. W. A. P. Fisher. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 50-61.

The more important developments in applied photoelasticity during the last eight years or so. 20 ref.

9-54. The Photography of Photoelastic Stress Patterns. H. McG. Ross. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 62-64.

Equipment and procedures.

9-55. A Note on Time-Edge Stresses in Photoelastic Models. J. W. Fitchie. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 65.

Trouble encountered with elimination of the above for a certain lot of phenol-formaldehyde plastic, since chemical reactions were apparently still taking place which caused residual stresses.

9-56. A Review of Some Strain-Measuring Devices. C. E. Phillips. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 66-72.

Devices used to overcome a wide variety of strain problems. 14 ref.

9-57. The Measurement of Strain in Metals by X-Rays. D. E. Thomas. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 73-82.

Methods and equipment, including theoretical basis.

9-58. A Note on Acoustic Strain Gauges. F. B. Bull. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 85-86.

Method of operation; satisfactory experience with above type of gage.

9-59. The Use of X-Rays for Investigation of Residual Stresses in Ships' Structures. K. J. Pascoe. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 83-84.

The apparatus used.

9-60. Summary of Additional Electrical Methods of Strain Measurement. G. E. Bennett. "Measurement of Stress and Strain in Solids," *Institute of Physics,* 1948, p. 87-110.

In addition to the resistance-wire and acoustic strain gages, others, using as a basis the two parameters, inductance and capacitance, which affect the flow of current through an electrical circuit, have been used extensively. Details of construction, operation, and circuits. 40 ref.

9-61. Changes in Internal Damping of Gas Turbine Materials Due to Continuous Vibration. G. B. Wilkes, Jr. *American Society of Mechanical Engineers,* Paper No. 48-A-95, 1948, 11 pages.

A pneumatically driven elevated-temperature fatigue machine and its control. Use of this machine to qualitatively determine initial damping as well as changes in damping of the test specimen during vibration. Variation in high-stress initial damping vs. temperature was qualitatively determined for four high-temperature alloys.

9-62. Comparison of High Temperature Alloys Tested as Blades in a Type B

Turbo-Supercharger. William C. Stewart and H. C. Ellinghausen. *American Society of Mechanical Engineers,* Paper No. 48-A-96, 1948, 16 pages.

A series of jet tests, utilizing gas produced from combustion of diesel fuel-oil, as a means for comparing resistance of high-temperature alloys to hot-gas impingement. The deficiencies of this method for simulating conditions in a gas turbine. Tests were at temperatures from 1200 to 1500° F. 16 ref.

9-63. Determination of Plate Compressive Strengths at Elevated Temperatures. George J. Heimerl and William M. Roberts. *National Advisory Committee for Aeronautics,* Technical Note No. 1806, Feb. 1949, 20 pages.

Local-instability tests of extruded 75S-T6 Al-alloy H-sections at stabilized elevated temperatures up to 600° F. Results show that methods available for calculating critical compressive stress at room temperature can be used at elevated temperatures if the applicable compressive stress-strain curve is given.

9-64. Fotoelasticita. (Photoelasticity.) Giuseppe Manzella. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 212-216.

A new method for photoelastic study of three-dimensional stresses by means of diffused light. Theoretical bases and possible practical applications. 10 ref.

9-65. Misura delle sollecitazioni col metodo della variazione di resistenza. (Determination of Stress by the Method of Variation of Electric Resistances.) Oreste Sappa. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 219-222.

The method and its theoretical basis. Several illustrations of the application of this method.

9-66. (Book). **The Measurement of Stress and Strain in Solids.** 114 pages. 1948. *Institute of Physics,* London.

Proceedings of a conference arranged by the Manchester and District Branch, Institute of Physics, July 11-13, 1946. (Individual papers are abstracted separately.)

9-67. (Book). **Electrical Resistance Strain Gauges.** W. B. Dobie and P. C. G. Isaac. 114 pages. English Universities Press, Ltd., St. Paul's House, London, E.C.4, England. 15s. net.

Attempts to cover too wide a field for its size, and includes chapters on fundamentals of electricity and electronics which are adequately covered elsewhere. The presentation is far too elementary for engineers and research workers. It is, however, the first attempt to satisfy a long-felt want, and contains useful and comprehensive tables of available British and American gages and their characteristics. (From review in *Journal of Scientific Instruments and of Physics in Industry.*)

9-68. (Book). **The Mechanical Testing of Metals and Alloys.** Ed. 4. P. Field Foster. Sir Isaac Pitman and Sons, Ltd., Parker St., Kingsway, London, W.C.2. 18s. net.

The chapter on tensile and bending tests is brought into line with recent British Standard specifications. The introductory chapters present the elementary theories of elasticity, and of the structure of metals, and subsequent sections describe the essential features of a wide range of testing equipment and auxiliary apparatus; the testing of wires and sheet metal is also described. Includes tables of mechanical properties of metals and alloys. Particularly suitable for laboratory use, and for mechanical engineering students. (From review in *Engineering.*)

9-69. Size Effects in Steels and Other Metals. P. E. Shearin, A. E. Ruark, and R. M. Trimble. "Report of a Conference on Strength of Solids", *The Physical Society,* 1948, p. 158-162. A condensation.

Previously abstracted from "Fracturing of Metals", *American Society for Metals* (also *Transactions of the American Society for Metals*); see item 9a-52, 1948.

9-70. Bibliography on X-Ray Stress Analysis With Subject Index. Herbert R. Isenburger. *St. John X-Ray Laboratory* (Califon, N. J.), 1949, 17 pages.

Consists of 240 references plus a reprint of the author's article, "Stress Analysis by X-Ray Diffraction," *Machinery,* v. 55, July 1947, p. 167-168. (See item 24-222, 1947.)

9-71. A Mathematical Theory of Photo-Viscoelasticity. Raymond D. Mindlin. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 206-216.

A phenomenological law of optical birefringence, induced by small strain in viscoelastic materials, is formulated and applied to an idealized medium. The resulting optical-stress-strain-time-temperature relations are used in finding conditions under which models of viscoelastic materials may be used in the photoelastic method for solving boundary-value problems in the linear theory of elasticity.

9-72. A Method of Determining the Percentage Elongation at Maximum

Load in the Tension Test. Paul G. Nelson and Joseph Winlock. *ASTM Bulletin,* Jan. 1949, p. 53-55.

New plotting method and its application to data for various ferrous and nonferrous metals and alloys.

9-73. Approximate Statistical Method for Fatigue Data. R. E. Peterson. *ASTM Bulletin,* Jan. 1949, p. 50-52.

Method believed to give somewhat better information than the measured width of the usual shaded scatter band. Results of application to monel.

9-74. Bonded Resistance Wire Strain Gages Simplify Determination of Creep Measurements. *Steel,* v. 124, Feb. 21, 1949, p. 115. Based on report by C. H. Betts, Canadian Bureau of Mines.

The taking of creep measurements by means of SR-4 gages instead of the conventional extensometer. Method is simple, accurate and sensitive, and avoids the problem of attaching cumbersome and inconvenient mechanical devices to test specimens.

9-75. A Method for Vibration Fatigue Tests of Stranded Conductor. Ai-Ting Yu and Bruce G. Johnston. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 1-6.

Wind-induced vibration of electrical conductors suspended between poles or towers often causes fatigue failure. Test method and apparatus for studying this phenomenon. A combination of the direct-coupled electromagnetic method and the indirect magnetic coupling method was used.

9-76. Strain Gage Survey Around the Supports of a 48-Foot Diameter Hortonsphere. L. P. Zick and C. E. Carlson. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 41-52.

Action of the column-to-shell connections of a 48-ft. diam. Hortonsphere supported on eight tubular columns. Strain-gage technique used.

9-77. A Bonded Wire Strain Gage Type Accelerometer. E. W. Kammer and Sherwood Holt, Jr. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 53-60.

An accelerometer in which a mass, when accelerated, causes axial strains to develop in a thin-walled duralumin cylinder. Bonded wire strain gages are placed on this cylinder to measure these strains. Design considerations, sensitivity, useful range of acceleration, and calibration methods.

9-78. Sensitivity Chart for Wire Resistance Strain Gages. G. L. Rogers. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 61-63.

Problems confronting the engineer in the use of strain gages, with particular reference to selection of the correct type of strain gage for various installations. A labor-saving method involving use of a chart for rapid selection and determination of the output of the proper gage.

9-79. Controlled Impulsive-Load Testing Machine. Robert J. Hansen. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 64-67.

Machine designed and constructed for use in an experimental program on the behavior of reinforced concrete beams subjected to concentrated dynamic loadings. It will produce an impulse the magnitude and duration of which can be controlled and varied from forces up to 10,000 lb. and durations of from 0.01 to 1 sec.

9-80. A Large Displacement Deformeter Apparatus for Stress Analysis With Elastic Models. William J. Eney. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 84-93.

Apparatus in which use of micrometer microscopes is eliminated. It differs from the Beggs deformeter principally in that much larger deformations are employed, the magnitude of gage displacements may be varied to fit the model, and deflections are measured with ordinary engineers' scales. Typical applications.

9-81. Further Properties of Photoelastic Fosterite at Elevated Temperatures. M. M. Leven. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 106-110.

Photoelastic Fosterite has been standardized for manufacture as a styrene-alkyd resin. Properties of this material of importance in photoelastic tests.

9-82. An Example of Efficient Design Through Strain Measurements. John C. New. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 111-119.

The example consists of a torpedo suspension band—a split, circular band about two ft. in diam. and about 4 in. broad. Forged bolting strips are butt welded to each end of the rolled band sheet and a suspension hook is welded at the top.

9-83. Experimental Determination of

Aircraft Loads. Bernard D. Haber. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 120-130.

Basic structural problems involved in determining aircraft loads; various load-measuring methods. A general method for determining loads acting on landing gears and truss-type structures is presented. Stress distributions in a few typical semi-monocoque aircraft structures demonstrate the relationship between conventional stress-analysis theory and actual strain-gage measurements.

9-84. Stress-Analysis Beyond the Elastic Range. Alfred M. Freudenthal. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 131-140.

Significance, in terms of stress, of the observable deformation of a material body subject to loads, and of differences in the character of inelastic behavior of different types of materials.

9-85. The Equivalent Static Accelerations of Shock Motions. J. P. Walsh and R. E. Blake. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 150-158.

Use of the reed gage as a method of determining important characteristics of shock motion. The "shock spectrum," thus derived, provides design conditions for "shock-proof" equipment in the form of equivalent static accelerations of the shock motion and a rational method for comparing the severity of different shock motions.

9-86. Comparison of High Temperature Alloys Tested as Blades in a Type B Turbo-Supercharger. W. C. Stewart and H. C. Ellinghausen. *Journal of the American Society of Naval Engineers,* v. 61, Feb. 1949, p. 169-188.

Previously abstracted from *American Society for Mechanical Engineers,* Paper No. 48-A-96, 1948. See item 9-62, 1949.

9-87. A Method of Assessing Transient Stresses in Photoelastic Substances. John S. Stanton. *Review of Scientific Instruments,* v. 20, Feb. 1949, p. 139-140.

A method for measuring the above when they are subjected to dynamic loading forces of any type. Consists essentially of combining techniques of conventional static photoelasticity and of the spark shadowgraph as used in the study of air-shock waves.

9-88. Hardness Jumps During the Coil Test; Peculiar Increase in Hardness. Ernest J. Baty. *Iron and Steel,* v. 22, Feb. 1949, p. 62.

Test for rapid inspection of bars in which they are passed through a solenoid excited by constant alternating current. In tests on high-carbon semi-toolsteel it is quite common for an audible click accompanied by change in meter readings corresponding to about 10 Brinell softening to be heard on passing a bar through the coil. This is readily explainable; but the opposite shift, which occurred repeatedly but less frequently, is not understood.

9-89. The N:S Relationship in Endurance Testing. Michael G. Corson. *Iron Age,* v. 163, Mar. 10, 1949, p. 103-105.

Seeking to reduce the time factor in endurance testing, the author has developed an equation whereby results can be calculated. Accuracy is indicated by application to published data obtained by conventional testing methods. It is applicable to both ferrous and nonferrous metals. N represents life expectation for a given overload and S the safe stress.

9-90. Fatigue and Static Load Tests of an Austenitic Cast Iron at Elevated Temperatures. W. Leighton Collins. *American Society for Testing Materials,* Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 13 pages.

Repeated-load and short-time static tests of unnotched and notched specimens. Results are compared to those published in 1941 for similar tests of a high-strength process cast iron.

9-91. An Hypothesis for the Determination of Cumulative Damage in Fatigue. F. E. Richart, Jr., and N. M. Newmark. *American Society for Testing Materials,* Advance Reprint from *Proceedings of the American Society for Testing Materials,* v. 48, 1948, 33 pages; discussion, p. 32-33.

Hypothesis for determination of the endurance of a material under any arbitrary overstress-cycle pattern and an experimental method of determining relative curves which are said to be sufficient to give correct estimates of endurance. Tests were carried out on large plate fatigue specimens and small rotating-beam specimens to verify the analysis. Values of endurance of specimens under several stress-cycle patterns agreed well with those computed from experimentally determined curves.

9-92. Low Temperature Performance Test on Rupture Diaphragms. W. L. Richardson and G. S. Storer. *U. S. Atomic Energy Commission,* AECD-2268, Aug. 31, 1948, 7 pages.

Results of application to Al and

Ag diaphragms of varying thickness.

9-93. Choix de la forme d'entaille dans l'essai de résilience. (Selection of Notch Type in Impact-Strength Testing.) J. Pomey, A. Cadilhac, and R. Coudray. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 455-467.

The influence of notch type and shape on impact strength of different steels was investigated. Various other factors such as composition of steels, heat treatment, direction of rolling.

9-94. Le role de l'état de surface dans les mesures de dureté. (Influence of the State of Surface on Hardness Testing.) P. Bastien and A. Popoff. *Journées des Etats de Surface,* 1946, p. 187-206; discussion, p. 206.

Previously abstracted from *Revue de Métallurgie.* See item 9-46, 1947.

9-95. Practical Applications of Stress Analysis at I-H. John A. Halgren, S. A. Sheridan, and Bernard Goodman. *Iron Age,* v. 163, Mar. 17, 1949, p. 76-80.

Stress analysis studies of mechanical parts at International Harvester, where the original or proposed design was inadequate for the service intended. Use of brittle lacquers and SR-4 strain gages. Residual stress-measurement techniques; methods for material analysis.

9-96. Mechanical Methods for the Measurement of Internal Stress. Hugh Ford. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 3-11; discussion, p. 375-397.

Various methods including calculation of the stresses from the measurements. Methods applicable to cylinders, thin-walled tubes, flat plates, and bars. 40 ref.

9-97. The Investigation of Internal Stresses by Physical Methods Other Than X-Ray Methods. R. King. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 13-23; discussion, p. 375-397.

Use of measurements of magnetic properties, electrical resistivity, and internal friction to observe changes in internal stresses produced by treatments such as cold work, quenching, or annealing. Quantitative determinations were made by means of magnetic measurements on plastically stretched and cold-drawn nickel wires.

9-98. Measurement of Internal Stresses by X-Rays. D. E. Thomas. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 25-30; discussion, p. 375-397.

Strain is indicated by the dimensions of the crystal lattice. By the back-reflection technique very high precision can be obtained if the lattice is sufficiently well formed to give diffracted beams at high angles. Use of normal and oblique incidence; the usual techniques; their advantages and disadvantages.

9-99. A Photoelastic Approach to Stress Modifications Caused by Inhomogeneities. B. Sugarman. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 281-288; discussion, p. 432-462.

Technique adopted to investigate, by means of photoelastic beam samples, stress concentrations due to inhomogeneities produced by the drilling of holes or repeated patterns of various forms. The investigations were mainly of two-dimensional plastics, but were supplemented by three-dimensional investigations.

9-100. Delayed Cracking in Hardened Alloy Steel Plates. E. H. Bucknall, W. Nicholls, and L. H. Toft. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 351-365; discussion, p. 463-484.

Wartime investigation into cracking in hardened alloy steel plates and welded structures. The "conical disc test" which was developed to simulate internal stresses in steels of this class. Dependence of cracking susceptibility on composition and on tempering treatment.

9-101. Kugeleindruckversuche bei hohen Geschwindigkeiten. (High-Velocity Ball Impression Tests.) Hubert Titze. *Stahl und Eisen,* v. 68, June 17, 1948, p. 238.

Static and dynamic tests were made with ball-bearing balls to determine the effect of speed of impact on hardness results for cold and hot steels.

9-102. Method of Determination of Resistance of Metals to Fracture Under Tensile Stress. (In Russian.) G. V. Uzhik. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1547-1560.

New method permits easy solution of the problem of absolute value of resistance to shear and tear at each moment of deformation. Typical data for two steels compared with results of other methods of testing. 10 ref.

9-103. Small Polarizing Apparatus Designated "IMASh-KB2" for Investigation of Stress in Structural Members

of Machines. (In Russian.) N. I. Prigorovskii and M. F. Bokshtein. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1599-1605.

An apparatus, using the polarization optical method of investigation with a transparent model, for study of stress distribution in structural parts.

9-104. New Methods of Bearing-Material Testing. (In Russian.) M. M. Khrushchov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1613-1620.

Specially developed methods and apparatus used for testing the wear-in property, the abrasive wear, the microhardness, and the fatigue strength of bearing alloys.

9-105. (Book.) **An Introduction to Photo-Elastic Analysis.** A. W. Hendry. Blackie and Son, Ltd., 66, Chandos-place, London, W.C. 2, England. 7s. 6d. net.

Begins by outlining the relevant elastic and optical theory, goes on to show how interference-fringe stress patterns are produced and interpreted, and then describes apparatus and materials, mentioning many useful details about the preparation of models, the technique of testing, and photography and analysis of records. Includes a brief description of three-dimensional "frozen-stress" photoelastic methods, and a selection of examples of two-dimensional stress problems in mechanical and structural engineering.

9-106. Prufung von Platinen fur Tiefziehbleche nach dem Verwindeversuch. (Testing Bar Stock for Deep-Drawing Sheet by Twisting.) Fritz Eisenkolb. *Stahl und Eisen*, v. 68, Jan. 29, 1948, p. 43-46.

Proposes a quick and reliable method of testing samples of rectangular steel bars which will reveal all internal defects, such as piping, slag inclusions, and cracks.

9-107. Zur Mechanik des Zugversuchs. (The Mechanics of the Tensile Test.) *Stahl und Eisen*, v. 68, Sept. 9, 1948, p. 361.

The relationships of longitudinal, radial, and tangent stresses, reduction in area, and stress equilibrium by means of which the flow curve for a series of materials was determined.

9-108. Method of Testing Fatigue of Steel Samples at High Temperatures. M. F. Sichikov and Z. D. Vishnevecky. *Engineers' Digest*, v. 10, Feb. 1949, p. 46. Translated and condensed from *Zavodskaya Laboratoria* (Factory Laboratory), Jan. 1948, p. 86-91.

Apparatus for determining fatigue of cylindrical test pieces at temperatures up to 600° C. while revolving at speeds of 5000 r.p.m. and above. An important feature is the mode of temperature determination.

9-109. Wanted: Better Criteria for Turbine Alloys. W. O. Sweeny. *Metal Progress*, v. 55, Mar. 1949, p. 315-318.

Limitations of present mechanical-test methods for the high-temperature alloys and fields where further investigation would be likely to be profitable. Further work on fundamental metallurgy as well as on test methods is considered desirable.

9-110. L'essai de fatigue sous charge progressive. Une nouvelle technique d'essai des matériaux. (Fatigue Testing Under Progressive Loading. A New Technique for Testing of Materials.) E. Marcel Prot. *Revue de Métallurgie*, v. 45, Dec. 1948, p. 481-489; discussion, p. 489.

Proposes method applicable to both metals and nonmetals, to a variety of tests and to any shape of test specimen. Theoretical bases and an apparatus for rotary-bending fatigue testing.

9-111. Choix de la forme d'entaille dans l'essai de résilience. (Selection of Notch Type for Impact-Strength Testing.) (Concluded.) J. Pomey, A. Cadilhac, and R. Coudray. *Revue de Métallurgie*, v. 45, Dec. 1948, p. 525-540.

As a result of experimental and theoretical investigation, a new type of notched test specimen was developed which is shown to give superior results.

9-112. Methods for Accelerated Testing of Cast High-Speed Steel. (In Russian.) I. R. Ushevskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Dec. 1948, p. 19-20.

New method consisting of determination of the mechanical properties of steel and its cutting ability.

9-113. Equipment for Determination of the Plasticity of Metal. (In Russian.) I. K. Antsiferov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1486-1488.

Existing apparatus and methods used in the USSR. Necessity of performing the determinations under conditions similar to those encountered in service.

9-114. Choix d'un outillage pour la coulée en coquille d'éprouvettes de traction de 13.8 mm de diametre pour

la mesure des caractéristiques mécaniques des alliages légers coulés en coquille. (Selection of Equipment for Casting of Test Specimens 13.8 Mm. in Diameter for Determination of Mechanical Characteristics of Light-Alloy Castings.) Jean Duport. *Fonderie*, Jan. 1949, p. 1447-1454.

Use of standard equipment for casting test specimens used in determination of mechanical properties of cast light alloys. This is recommended because the method of casting and equipment influence these properties to a great extent.

9-115. Betrachtungen zum Verschleissproblem. (Observations on the Problem of Wear.) Werner Bottenberg. *Die Neue Giesserei*, v. 36, (new ser., v. 2), Feb. 1949, p. 39-45.

Methods of determining the wear of steel and iron. Present methods do not give comparable data; the various types of wear are so different that no generally valid indices can be expected. Because of the close correlation between wear and corrosion, successful methods of corrosion research are recommended for studying the problem of wear. Special wear-testing methods and results. 37 ref.

9-116. A History of Hardness Tests Based on Scratch Resistance Measurements. Ernest C. Bernhardt. *ASTM Bulletin*, Mar. 1949, p. 49-53.

A history of various scratch methods which have been devised as tests for hardness, compiled as a preliminary survey in a study of the scratch resistance of plastics. 14 ref.

9-117. Testing Vehicle Components With Strain Gages. Robert C. Hizer. *Product Engineering*, v. 20, Apr. 1949, p. 134-137.

Stress measurements in service testing of heavy vehicles; construction and calibration of a drawbar; and measurement of drawbar pull and of torque in drive shafts, starter motors, and transmissions.

9-118. Gages Measure Strain on Rotating Engine Parts. *SAE Journal*, v. 57, Apr. 1949, p. 46-49. Based on "Strain Measurements on Rotating Parts" by R. E. Gorton and R. W. Pratt. (To be published in *SAE Quarterly Transactions.*)

For use on rotating parts, leads carry the electrical signal from the gage to a slip-ring assembly, which connects the rotating members with wires extending to the measuring or recording apparatus. The applications required extensive refinements of strain-gage apparatus and techniques.

9-119. Some Experiments on a Bearing and Wear-Testing Machine. A. Cameron. *Journal of the Institute of Petroleum*, v. 35, Feb. 1949, p. 126-131.

Modifications of a Timken wear-testing machine made to illustrate the principles of film lubrication. Actual frictional drag, measured friction coefficient, and frictional drag and time during running in.

9-120. Influence de la forme et des dimensions de l'éprouvette sur la limite de fatigue. (Influence of the Shape and Size of the Sample on the Fatigue Limit.) Pierre Laurent. *Revue de Métallurgie*, v. 46, Jan. 1949, p. 55-59; discussion, p. 59.

Attempts to explain the facts that in fatigue testing, fracture occurs at stresses lower than the elastic limit, that resistance to fatigue does not follow Kick's law (fatigue strength decreases with increase of the size of the test specimen), and that the surface condition is much more important than in other mechanical tests. 14 ref.

9-121. Stress Analysis for the Steel Foundry. Robert G. Waite. *Foundry*, v. 77, May 1949, p. 106-107, 252, 254.

The nature and magnitude of residual stresses induced by welding plates in openings in castings.

9-122. Determining Stresses in 110-Ton Gooseneck Trailer by Strain Gage Method. Given Brewer. *Automotive Industries*, v. 100, May 1, 1949, p. 42-44, 74.

Describes and diagrams methods. Load vs. strain curves for various gage locations.

9-123. New Methods of High-Temperature Mechanical Testing. (In Russian.) A. M. Borzdyka. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 70-75.

Methods used for testing at a controlled rate of elongation, for creep testing at 800-1200° C.; for creep testing during bending; and for testing by a relaxation method. 11 ref.

9-124. Centrifugal Method for Investigating Strength of Metals and Alloys at High Temperatures. (In Russian.) I. I. Kornilov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 76-82.

A new type of apparatus particularly applicable for determination of the bending strength of a material in the range from room temperature up to 1200° C. Conditions of testing using such a method are very close to those of practical application.

9-125. Fatigue-Testing Machine for Use at High-Temperatures. (In Russian.) N. I. Mikheev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 82-85.

A special machine developed. Size and shape of test specimens. Maximum temperature of testing is 900° C.; maximum stress is 60 kg. per sq. mm.; accuracy of temperature control is ±2° C.

9-126. Machine for Fatigue Testing a Stationary Test Specimen at Elevated Temperatures. (In Russian.) S. I. Yatskevich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 86-88.

New type of apparatus. Maximum stress obtainable is 50 kg. per sq. mm. Circuit diagram of the heating chamber.

9-127. Fatigue-Testing Machine for Horizontal Bending. (In Russian.) A. N. Mitinskii and V. A. Bykov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 89-91.

Structural details of the machine and shape and size of test specimens used. Simplicity of construction and possibility of investigating relatively large test specimens.

9-128. Determination of Coefficient of Sliding Friction. (In Russian.) I. A. Savostin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 96-99.

A specially constructed machine for the above. Theoretical bases of this method of testing.

9-129. Application of Pulsating Device for Testing Transmission-Gear Teeth Using a Large Model. (In Russian.) R. S. Nikolaev, E. F. Mikhenko, and L. M. Shkol'nik. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 124-125.

Device and how it is used.

9-130. Mechanical Testing of Welded Joints. (In Russian.) F. I. Razdui. *Avtogennoe Delo* (Welding), Jan. 1949, p. 21-22.

Standard tensile and bending tests according to the All-Union Standard, including the size of test specimens for different types of welding.

9-131. Theory of Hardness and Measurements Applicable to Contact Problems. Else Holm, Ragnar Holm, and Erle I. Shobert, II. *Journal of Applied Physics,* v. 20, Apr. 1949, p. 319-327.

The ball indentation method is recommended for the determination of real contact area. Hardness is defined as the ratio between the contact load and the mouth area of indentation. Variation of hardness with geometric and metallurgical conditions and the relation between hardness and yield point. 10 ref.

9-132. Testing Tractor Gears. *SAE Journal,* v. 57, May 1949, p. 38-40. Based on "Gear Testing Methods for the Development of Heavy-Duty Gearing" by R. P. Van Zandt and B. W. Kelley.

9-133. Fatigue and Static Load Tests of an Austenitic Cast Iron at Elevated Temperatures. W. Leighton Collins. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 696-705; discussion, p. 706-708.

Previously abstracted from Advance Reprint. See item 9-90, 1949.

9-134. An Hypothesis for the Determination of Cumulative Damage in Fatigue. F. E. Richart, Jr., and N. M. Newmark. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 767-798; discussion, p. 799-800.

Previously abstracted from advance reprint. See item 9-91, 1949.

9-135. Testing Speed Limitations for Committee A-1 Specifications for Steel. Lawford H. Fry. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 1130-1132.

Previously abstracted from preprint. See item 9b-32, 1948.

9-136. The Effect of Speed of Testing on Magnesium-Base Alloys. A. A. Moore. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 1133-1138.

Results of an extensive series of tension and compression tests at various speeds. Different means of specifying speed of testing.

9-137. Methods and Equipment for Controlling Speed of Testing. Lawrence K. Hyde. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 1191-1199; discussion, p. 1200.

Device for controlling rate of application of load or rate of travel of the crosshead so as to obtain a predetermined uniform rate of straining throughout the elastic range and as far as desired into the plastic range. Also a simple time-interval marking device.

9-138. Flexural Fatigue Strength of Steel Beams. Wilbur M. Wilson. *University of Illinois, Engineering Experiment Station,* Bulletin Series No. 377, Jan. 22, 1948, 34 pages. *(University of Illinois Bulletin,* v. 45, no. 33.)

Previously abstracted from *Welding Journal,* item 9b-47, 1948.

9-139. Das Verhalten dunner Querschnitte bei Schlagbeanspruchung und tiefer Temperatur (Kerbschlagversuche). [The Behavior of Thin Metals Under Impact Stress and at Low Temperatures (Notch-Impact Tests).] An-

ton Pomp and Alfred Krisch. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 19-25.

To develop small standard impact bars, comparative impact tests were made with standard bars and with bars measuring 6 x 3 x 55, 6 x 3 x 45, and 4 x 3 x 27 mm. provided with V, key-hole, and round notches. The thin specimens were found to have less temperature sensitivity from −80 to +150° C. Additional tests determined the effect of sample width on temperature sensitivity of alloyed and unalloyed steels between 20 and −183° C. 29 ref.

9-140. Beitrag zur Entwicklung einer kleinen Kerbschlagprobe. (Developing a Small Notch-Impact Bar.) Nikolaus Ludwig. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 27-29.

Notch-impact strength of 6 x 6 x 44 mm. bars was determined from −80 to 200° C. Results are compared with those obtained with the standard bar.

9-141. Das Verhältnis der Kerbschlagzähigkeit bei Verwendung verschiedener Probenformen. (The Relationship of the Notch-Impact Strengths of Different Shapes of Test Specimens.) Carl Bihlmaier. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 31-35.

Notch-impact values of different forms and corresponding conversion.

9-142. Einfluss der Kerbform und Bearbeitung auf die Schlagzähigkeit von Stahl in der Kälte. (Effect of Notch Form and Surface Condition on the Impact Strength of Steel at Reduced Temperatures.) Walter Reinecken. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 37-39.

Investigated for five different steels at temperatures from 20 to −40° C. Yield point, tensile strength, elongation, and contraction of area of each steel at the various temperatures.

9-143. The Relaxation Test in Terms of Creep and Creep Recovery. E. A. Johnson. *Metallurgia,* v. 39, Apr. 1949, p. 291-297.

An effort to ascertain the relative importance of creep recovery as a link between the relaxation test and normal creep tests. Relaxation tests from relatively high and relatively low initial total strains were made on a 0.17%-C steel at 445° C., and on a Cr-Mo steel at 485° C. Estimates of creep recovery during the relaxation test were made by completely unloading the specimen at intervals during the test. Adjustment of measured creep rates was made to allow for effects of negative recovery strain; and modified relaxation-creep rates were compared with rates computed from auxiliary creep tests.

9-144. Mechanical Testing of Cast Iron. A. Portevin. *Metal Progress,* v. 55, May 1949, p. 657-658.

Relationship of mechanical properties to composition and ultimate use; relation between mechanical properties of the casting itself and results of tests made on separately cast specimens; and reproducibility of results of a given test.

9-145. Stress Analysis of a Hortonsphere. L. P. Zick and C. E. Carlson. *Welding Journal,* v. 28, May 1949, p. 205s-214s.

Strain-gage survey around the supports of a 48-ft. diam. Hortonsphere. Present design-stress allowances proved adequate.

9-146. Variable Stroke Fatigue Mechanism. *Machine Design,* v. 21, May 1949, p. 144-145.

Machine designed for study of full-sized machines and structural parts normally subjected to low-frequency vibrations or stress variations. It is capable of loading a part 5 x 5 x 5 ft. to 10,000 lb. in tension or compression at 250 cycles per min. Stroke can be varied from 0-8 in.

9-147. The Accurate Measurement of Photo-Elastic Stress Patterns. *Engineer,* v. 187, Apr. 29, 1949, p. 468.

Principles of plane and three-dimensional stress analysis and photoelastic method and apparatus.

9-148. Testing and Inspection. J. T. Stacy. *Metals Review,* v. 22, May 1949, p. 5-8.

Improvements in common mechanical test methods and equipment, some new ways of predicting behavior of metals, and unusual kinks in inspection, as revealed by technical literature of the past year. Reference to "A.S.M. Review of Current Metal Literature."

9-149. A Visual Method for Demonstrating the Path of Ultrasonic Waves Through Thin Plates of Material. Charles J. Burton and R. Bowling Barnes. *Journal of Applied Physics,* v. 20, May 1949, p.462-467.

Method and the complexity of ultrasonic reflection and transmission by metal plates. An attempt to estimate critical angles of total reflection for dilatation and shear waves by visual examination of reflection of an ultrasonic beam. Using these data, Young's modulus and

the shear modulus for a 1/16-in. aluminum sheet were determined and the values compared with those obtained using a previously described electrical method and with published data. 10 ref.

9-150. Experiments on the Plastic Failure of Cylindrical Shells. A. J. S. Pippard and Letitia Chitty. *Sheet Metal Industries,* v. 26, May 1949, p. 981-983. A condensation.

Object of investigation was to study the behavior of cylindrical shells when loaded beyond the elastic range by forces acting on a small area of the surface, and under certain specified conditions of support. Experiments included static tests in a test frame, dynamic tests by means of dropping weights, and a few tests under hydrostatic pressure.

9-151. Hardness Test Measures Tensile Strength of Manganese Bronze. Robert J. Feltrin. *Foundry,* v. 77, June 1949, p. 74-75, 230.

Use of test where marine propellers up to 20 ft. in diam. are cast to meet a tensile-strength range of 70,000-80,000 psi. Composition is: Cu, 56-58%; Zn, 37.0-41.0%; Mn, 0.5-1.0%; Al, 1.1-1.3%; Fe, 0.9-1.1%; Sn, 0.4-0.6%; and Ni, 1.0%.

9-152. Behavior of Metals Under Direct or Nonreversed Loading. John R. Low, Jr. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949 p. 17-59.

Standard tension test at room temperature and low strain rates. Typical true stress-strain curves together with recent observations on the general equation for form of curves. Compression test and its limitations. Data for ferrous metals and alloys. 19 ref.

9-153. Determination of the State of Stress. W. M. Murray. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 79-99.

Methods and apparatus available. 15 ref.

9-154. Testing to Specific Deflections (Buckling). E. C. Hartmann. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 124-139.

Testing for design and quality control. Column and beam tests for buckling.

9-155. Micro-Hardness Testing—A New Testing Method With Many Practical Applications. E. B. Bergsman. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 91-96.

The method, different types of apparatus, and examples of application.

9-156. Uber die Messung von grossen Kräften. (Concerning the Measurement of Large Forces.) P. Nycander. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 99-104.

A temperature-insensitive hydraulic method of determining absolute values of compressive forces up to 500 metric tons used for the purpose of calibrating testing machines.

9-157. Electric Resistance Wire Strain Gage Technique in Aircraft Structural Work. L. A. Strömberg. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 118-122.

Procedures and equipment used in Sweden.

9-158. Prufung metallischer Werkstoffe in der Kälte. (Low-Temperature Testing of Metals.) Karl Wellinger and Artur Hofmann. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 233-239.

Low-temperature tensile and fatigue-strength testing machines. Low-temperature strengths of pure Al, of a 3%-Mg Al alloy, and of a 2%-Mn, 2%-Mg Al alloy. 24 ref.

9-159. Automatic Torque Magnetometer Measures Magnetic Anisotropy of Steel. *Steel Processing,* v. 35, May 1949, p. 245-247.

9-160. Quality in Drawing Steel. C. A. Burkhalter. *Steel Processing,* v. 35, May 1949, p. 250-251, 262. A condensation.

Problem of evaluation of drawability which is complicated by the large number of test methods in use. Attempts to classify commonly used tests on the basis of practicability. Procedures.

9-161. Two New Instruments for Materials Testing. K. Ruhl. *Engineers' Digest,* v. 10, May 1949, p. 168. Translated and condensed from *Die Technik,* v. 3, July 1948, p. 301-304.

Inductive accelerometer and clock-gage-type extensometer for measuring strains.

9-162. Resistance of Materials. *Machine Design,* v. 21, June 1949, p. 105-106.

Equipment used by Allis-Chalmers to determine resistance to the destructive action of cavitation. High-frequency oscillator vibrates specimen at 6500 cycles per sec. with amplitude of 0.00342 in.

9-163. A 30-Ton Universal Testing Machine. *Engineer,* v. 187, May 13, 1949, p. 533-535.

British equipment.

9-164. Chart Eases Selection of Resistance Gage. *Aviation Week,* v. 50, June 6, 1949, p. 33-34.

Chart to facilitate selection of bonded electric strain gages for specific installations.

9-165. Report of Committee A-6 on Magnetic Properties. *American Society for Testing Materials,* Preprint 4, 1949, 32 pages.

Includes proposed revised standard methods for testing magnetic materials; for determining normal induction and hysteresis (13 ref.); and for core loss and permeability by a.c. procedures.

9-166. A New High-Speed Sheet Metal Fatigue Testing Machine for Unsymmetrical Bending Studies. G. R. Gohn and E. R. Morton. *American Society for Testing Materials,* Preprint 31, 1949, 12 pages.

Constant-deflection machine suitable for testing 24 sheet-metal specimens simultaneously at as many as 12 different values of mean stress and at any testing speed up to 3000 r.p.m. Alternating stresses ranging from zero to a maximum value corresponding to a deflection of 1 in. may be superimposed upon any mean stress of such magnitude that the total deflection does not exceed 2 in. The machine is capable of testing sheet or strip of 0.010-0.050 in. thickness.

9-167. Effect of Speed of Testing on the Tensile Properties of Austenitic Stainless Steel Sheets. R. H. Heyer. *ASTM Bulletin,* May 1949, p. 57-62.

Presents and correlates results of a cooperative test program.

9-168. Influence of Type of Machine, Range of Speed, and Specimen Shape on Fatigue Test Data. P. K. Roos, D. C. Lemmon, and J. T. Ransom. *ASTM Bulletin,* May 1949, p. 63-65.

Tests were made on flat and round specimens of SAE 4340 steel in pure reversed plane bending at 1800 r.p.m. on a Sonntag universal machine; and on round specimens acting as rotating beams on R.R. Moore machines at 1800 and 10,000 r.p.m.

9-169. New Optical Method for Study of Stresses by Polarized Light. (In Russian.) A. V. Stepanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 205-217.

New optical method and apparatus and its application to study of stresses in silver chloride crystals which, being transparent and possessing structure and mechanical properties similar to those of metals, permits derivation of conclusions and laws applicable to the latter.

9-170. Contemporary Development of an Optical Polarization Method for Determination of Stresses. (In Russian.) N. I. Prigorovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 305-321.

Use of transparent models, both two and three dimensional, for the determination of the distribution and value of stresses. Theoretical bases of this method and formulas for calculation. 19 ref.

9-171. Portable Creep-Test Machine. (In Russian.) M. P. Markovets and N. I. Mikheev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 376-378.

Apparatus suitable for temperatures up to 900° C. with a maximum load of 800 kg. Electric circuit for automatic control of temperature within ±2° C.

9-172. Apparatus for Testing of Springs in Compression and Tension on the Rockwell Apparatus. (In Russian.) N. M. Stepanov-Grebennikov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 378-379.

Apparatus and method of its calibration and operation. It is designed for loads of 10-150 kg. and for springs, tested in compression, of 150-mm. length, and in tension, of 100-mm. length.

9-173. Festigkeitsprufverfahren fur Stahldraht. (Strength Testing Methods for Steel Wire.) N. Ludwig. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 49-66.

Evaluates the various methods. 48 ref.

9-174. Resisténcia a tracao e composicao quimica no ferro fundido cinzento. (Tensile Strength and Chemical Composition of Cast Iron.) Egon Schmiegelow and Joao Mendes Franca. *Boletim da Associacao Brasileira de Metais,* v. 5, Jan. 1949, p. 27-40.

Critically analyzes Heller and Jungbluth's formula for calculation of tensile strength of cast iron from tests on two specimens of different diameters. Proposes a new graphic method for such determination, including the influence of chemical composition. Diagram permits a rapid determination of tensile strength on the basis of data obtained from testing a standard specimen.

9-175. A Carrier-Type Strain Indicator. George W. Cook. *David W. Taylor Model Basin, U. S. Navy,* Report 565, Nov. 1946, 28 pages.

An electronic instrument which is suitable for measuring and recording static and dynamic strains by

means of strain gages of the wire-resistance type and suitable recording apparatus.

9-176. (Book) **Indentation Hardness Testing.** Vincent E. Lysaght. 290 pages. Reinhold Publishing Corp., 330 W. 42nd St., New York 18. N. Y. $5.50.

Hardness testers in common use in the U. S. and the problems associated with their use. Sufficient historical background is presented to acquaint the reader with the development of various instruments. Likewise, sufficient theory is given for a thorough knowledge of the present status of hardness testing.

9-177. The Time Delay for the Initiation of Plastic Deformation at Rapidly Applied Constant Stress. D. S. Clark and D. S. Wood. *American Society for Testing Materials,* Preprint 25, 1949, 19 pages.

Design and construction of a special rapid-load testing machine with which tensile loads may be applied for 5 millisec. and longer. Tests made on an annealed low-carbon steel. Definite time delay is required for the initiation of plastic deformation in this material and this delay depends upon applied stress. Experimental results on five materials for which the stress-strain curve does not exhibit a definite yield point.

9-178. A Standard Method of Determining Stresses in Glass-to-Metal Seals of the Sandwich and Bead Types. *Journal of the Society of Glass Technology,* v. 33 (Transactions Section), Feb. 1949, p. 77-81.

Photo-elastic method.

9-179. A Report of Some Recent Research Into the Measurement and Relaxation of Residual Stresses. W. Soete. *Sheet Metal Industries,* v. 26, June 1949, p. 1269-1280.

Classifies residual stresses as reaction, macroscopic, and microscopic types. The macroscopic stresses are dealt with. Method developed for measuring them in which resistance strain gages are placed in star form about a small hole drilled in the material being investigated. Nature of residual stresses and possible methods for their relief, including low temperature and mechanical methods. Results of experiments. 23 ref.

9-180. A Mechanical Test to Measure the Workability of Wire. Walston Chubb, Jr., and D. S. Eppelsheimer. *Wire and Wire Products,* v. 24, June 1949, p. 491-493, 545-546.

Transverse crimp-sensitivity test which is essentially a refinement of the bend test for ductile materials. It has been found to be capable of detecting very small differences in workability or stiffness; it will detect differences in hardness of hard-drawn wire and in heat treatment of annealed wire, as well as all defects which affect workability.

9-181. Static vs. Dynamic Test Methods. John N. Kenyon. *Wire and Wire Products,* v. 24, June 1949, p. 498, 500, 525-527.

Machines of the two types as used for testing of wire. Features of specific machines of each type.

9-182. Slow-Motion Pictures of Impact Tests by Means of Photoelasticity. Ludwig Foeppl. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), June 1949, p. 173-177.

Resulted in verification of the classical theory of St. Venant and Flamant. Details of two of the tests: one in which impact was of moderate intensity, so that response was entirely elastic; and one in which impact was strong enough to break the test bar.

9-183. Correlation of Tension Creep Tests With Relaxation Tests. Irving Roberts. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), June 1949, p. 208.

Analytical solutions to the bolt relaxation problem, based upon empirical creep-data equations, may be obtained by direct substitution, rather than by differentiation and integration, as was done by Soderberg, Popov, and Housner.

9-184. Hardness Indenter Sockets. *Industrial Diamond Review,* new ser., v. 9, May 1949, p. 147.

Dimensions of holder or socket for a number of important hardness testers.

9-185. An Experimental Investigation by a Dynamical Method of the Variation of Young's Modulus with Temperature. G. E. Bennett and R. M. Davies. *Journal of the Institute of Metals,* v. 75, May 1949, p. 759-776.

Method in which the specimen, in the form of a fixed-free bar about 2.5 cm. long, is maintained in transverse vibration by the action of superimposed steady and alternating magnetic fields. Resonance is detected by a phonograph pickup whose output is amplified, rectified, and applied to a galvanometer. Young's modulus-temperature curves are given for commercial brass; Cu; mild steel; Fe; Ni; Co; Monel; 44%-Ni, 56%-Cu alloy; 48%-

Ni, 52%-Fe alloy; β-brass; and a Cu-Au alloy. Results are compared with those of previous investigators. 22 ref.

9-186. Methods of Speed Control for Testing Machines. Lawrence K. Hyde. *Instruments,* v. 22, June 1949, p. 495-497.

Previously abstracted from *American Society for Testing Materials, Proceedings,* item 9-137, 1949.

9-187. Creep in Metals and Methods of Creep Testing. M. Randall. *Machinery* (London), v. 74, June 9, 1949, p. 772-773.

Typical creep-rate vs. stress and creep vs. time curves.

9-188. Application of Electrical Resistance Strain Gauges. A. L. Tannahill. *Engineer,* v. 187, June 10, 1949, p. 630-633.

Little published information can be found on techniques for applying strain gages and temperature compensators to surfaces and protecting them against damp atmospheres, drafts, liquids, or other substances which may come in contact with them. Hence, a research investigation of this subject was undertaken. As a result detailed directions are given for exterior gages (for use in air), and for interior gages (for use under water).

9-189. Air Conditioning Cuts Out Creep Test Compensations. *Steel,* v. 125, July 4, 1949, p. 95.

Creep-testing machines and testing porcedure in an air-conditioned room held at constant temperature at the research laboratory of National Tube Co.

9-190. Effect of Pulsating Loads on the Creep Characteristics of Aluminum Alloy 14S-T. M. J. Manjoine. *American Society for Testing Materials,* Preprint 27, 1949, 11 pages.

A testing machine in which oscillating and steady loads may be applied was developed to check the influence of adding a small oscillating stress to the steady stress in a creep-rupture test. Results of a series of tests at 400° F. of 14S-T Al alloy specimens under an oscillating stress of 10% of the mean stress are reported. A possible explanation of the results.

9-191. Fatigue Characteristics of Aluminum Alloy 75S-T6 Plate in Reversed Bending as Affected by Type of Machine and Specimen. T. T. Oberg and R. J. Rooney. *American Society for Testing Materials,* Preprint 28, 1949, 9 pages.

Vibratory nonrotating cantilever fatigue tests were made in a Krouse plate fatigue machine (fixed deflection), using specimens having round, square, and rectangular critical sections. Rotating-beam specimens were tested in an R. R. Moore machine. Fatigue curves obtained for the various shapes showed maximum fatigue strengths for round specimens.

9-192. Life Tests Help to Choose Die Materials. J. R. Taylor and A. T. Hamill. *American Machinist,* v. 93, July 14, 1949, p. 116-118.

Several cast-alloy compositions and some cemented carbides were tested for suitability in long-life lamination dies. Typical compositions and properties of various cast alloys.

9-193. Apparatus for Tensile Testing at Sub-Zero Temperatures. E. J. Ripling and G. Tuer. *Engineers' Digest,* v. 10, June 1949, p. 199-200.

Previously abstracted from *Product Engineering.* See item 9-24, 1949.

9-194. Determination of Hardness of High-Speed Toolsteels at High Temperature. (In Russian.) A. P. Gulyaev and R. I. Mitel'berg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 447-453.

Peculiarity of method described is compression of cylindrical test specimens at high temperature. Six different commonly used types of high speed steels have been investigated by this method. Results correspond closely to those obtained by other methods.

9-195. Applicability of a Method Using a Conical Indenter for Determination of Yield Point at High Rates of Deformation. (In Russian.) F. F. Vitman and N. A. Zlatin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 453-456.

The data obtained are quite approximate, hence the method is recommended only when low accuracy may be justified by speed and simplicity of the determination. 10 ref.

9-196. A Basic Method of Determination and Calculation of Hardness. (In Russian.) V. K. Gringorovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 457-460.

Critically analyzes existing methods for hardness determination. The methods used for calculation of hardness from the test readings sometimes result in erroneous interpretations. A new method is proposed which would standardize such determinations.

9-197. Apparatus for Determination of Temperature Variation of Modulus

of Elasticity by a Vibration Method. (In Russian.) V. A. Zhuravlev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 460-463.

Theoretical basis and technique for mathematical analysis of the results.

9-198. Wear Testing of Materials. (In Russian.) E. N. Maslov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 464-465.

A new type of apparatus. Results of testing of four different alloys (compositions given).

9-199. X-Ray Determination of Principal Stresses Using a Notch Method. (In Russian.) S. O. Tsobkallo and D. M. Vasil'ev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 468-470.

A new method for differentiated determination of principal stresses, developed by Terminasov and Sokolov. Theoretical bases of this method and techniques for calculation.

9-200. Testing of Non-Ferrous Metals for Production of Flat Springs. (In Russian.) M. A. Shklyar. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 474.

Simplified method based on that proposed by Butra. This method, already applied on an industrial scale, is valued because of its simplicity and rapidity.

9-201. Fatigue-Test Machine for High-Temperature Testing. (In Russian.) M. L. Bernshtein. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 497-500.

Optimum conditions of operation and method of calculation.

9-202. Creep-Test Machine Operating at Temperatures up to 800° C. (In Russian.) M. P. Markovets, T. N. Stasyuk, and N. N. Kolupaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 500-502.

Complete specifications for equipment in operation in the Soviet Institute of Aviation Materials.

9-203. Undersökning av halborrade dragprovstavar. (Tensile Tests Using Test Pieces With Holes Bored in Them.) Gunnar Malmberg. *Jernkontorets Annaler,* v. 133, no. 4, 1949, p. 153-162.

Investigation using flat pieces of mild structural steel in which two parallel holes were bored from the flat sides and slits cut from the edges to the holes. When the diameter of the holes was varied, there was, as a rule, a transition from tough to brittle fracture. The diameter at which this transition takes place is a measure of the degree of brittleness of the steel.

9-204. Werkstoffprufung. (Testing of Materials.) E. Siebel, N. Ludwig, H. Nowotny, O. Vaupel, and H. Schallbroch. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 175-256.

Reviews German literature for 1939-46 in separate sections as follows: strength of metals in testing and in structures (Siebel); methods and apparatus for strength testing (Ludwig); cavitation wear (Nowotny); nondestructive testing of materials (Vaupel); and machinability and machinability testing (Schallbroch). 609 ref.

9-205. Tests of Ductility in Ship Structure. Wendell P. Roop. "Symposium on Deformation of Metals as Related to Forming and Service", (ASTM Special Technical Publication No. 87), 1948, p. 4-14.

Significant requirements. External and internal equivalence; notching; eccentricity, and constraint; concentration of stress and localization of strain; notched tension; notched flat plates and ships' decks; and logical reasons for use of flat tensile-test plates. 14 ref.

9-206. Notch-Sensitivity of Ship Plate —Correlation of Laboratory-Scale Tests With Large-Scale Plate Tests. Noah A. Kahn and Emil A. Imbembo. "Symposium on Deformation of Metals as Related to Forming and Service", (ASTM Special Technical Publication No. 87), 1948, p. 15-44; discussion, p. 45-52.

Mechanism of fracture and notch-sensitivity characteristics of mild or medium steels and test methods for evaluation of susceptibility of ship plate to brittle or cleavage fracture. Deals particularly with the Navy tear-test method for quality control of ship plate. Data on the influence of nitrogen content and effects of variations in the geometry of the test specimen. 12 ref.

9-207. Measurement of Ductility in Sheet Metals. John R. Low, Jr., and Thomas A. Prater. "Symposium on Deformation of Metals as Related to Forming and Service", (ASTM Special Technical Publication No. 87), 1948, p. 53-63; discussion, p. 64-65.

Methods for measurement of uniform elongation and reduction of area in modified tension-type tests of sheet metals. Relationship between the two and forming limits in various types of forming operations, particularly stretching and bending. 12 ref.

9-208. Hydraulic Bulge Testing of Sheet Metals. W. T. Lankford. "Symposium on Deformation of Metals as

Related to Forming and Service", (ASTM Special Technical Publication No. 87), 1948, p. 66-80; discussion, p. 81-82.

Permits stretching of sheet specimens in more than one direction. The circular bulge test was studied, and an elliptical bulge test was developed which stretches the specimen more in one direction than in the other. Tests were applied to strain hardening characteristics and ductility of several Al-alloy sheet materials under combined biaxial tensile stresses.

9-209. Notched Bar Tension Tests on Annealed Carbon Steel Specimens of Various Sizes and Contours. M. L. Fried and G. Sachs. "Symposium on Deformation of Metals as Related to Forming and Service", (ASTM Special Technical Publication No. 87), 1948, p. 83-115; discussion, p. 116-117.

Effects of section size and notch contour on strength and fracture properties of fully annealed SAE 1025 silicon-killed steel. An analysis was made of the fractured surfaces of specimens tested and relative amounts of flat, shear, fibrous, and cleavage areas were obtained. Longitudinal and circumferential strains on the surface were measured after given amounts of strain and after fracture, and distribution of hardness over longitudinal sections was obtained. Method for calculating distribution of longitudinal, radial, and circumferential strains over the notched section. 20 ref.

9-210. Beoordeling van de koudbrosheid van dun plaatijzer met de heenen weerbuigproef. (Determination of Cold-Brittleness of Thin Sheet Iron by Means of Repeated Bending.) J. H. Palm. *Metalen,* v. 3, Mar. 1949, p. 145-148.

Results of experimental work which indicate that the repeated-bending test is preferable to impact testing.

9-211. Rapid Method for Determination of the Hardness of Welds. (In Russian.) O. G. Vegner. *Avtogennoe Delo* (Welding), Mar. 1949, p. 21.

Method using a modified Poldi apparatus.

9-212. Praktische Verschleissprufung. (Practical Wear Testing.) H. Wahl. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 121-128.

Industrial and laboratory methods, instruments, and problems of testing the wear resistance of metals. 28 ref.

9-213. Halbautomatische Festigkeitsprufung von Leichtmetallblechen. (Semi-Automatic Strength Testing of Light-Metal Sheets.) Kurt Matthaes. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 198-200.

An attachment to the tensile-testing machine which records automatically the 0.2 yield point, tensile strength, and elongation.

9-214. Choice of the Shape of Notch in the Notch-Toughness Test. J. Pomey, A. Cadilhac, and R. Coudray. *Metallurgia,* v. 40, June 1949, p. 122. Translated and condensed from *Revue de Métallurgie,* v. 45, Nov. 1948, p. 455-467; Dec. 1948, p. 525-540.

Previously abstracted from original, items 9-93 and 9-111, 1949.

9-215. Two Million Pound-Inch Torsion Testing Machine Completed at Lehigh University. *Steel Processing,* v. 35, June 1949, p. 309.

9-216. Bulge Testing of Sheet Metal. Helmut Thielsch. *Metal Progress,* v. 56, July 1949, p. 86-88.

Attempts to bridge the gap between theoretical work and practical test procedures. Believes that bulge testing may have better correlation with formability of sheet metals than other cupping tests. Data for 2S-O aluminum.

9-217. Creep-Testing Facilities Expanded by National Tube Research Laboratory. *Industrial Heating,* v. 16, July 1949, p. 1176, 1178, 1180.

9-218. Testing Magnetic Materials. B. M. Smith. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 3-15.

Some accepted methods and instruments commonly used by the electrical manufacturing industry in the development, design, and control of magnetic materials. 12 ref.

9-219. Permanent Magnet Test Methods and Their Validity in Determining Product Performance. C. A. Maynard and J. E. Mitch. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 17-28; discussion p. 29.

Various factors involved in selection of suitable tests for the relationship between product performance and magnetic tests.

9-220. Core Loss Test for Narrow Silicon Steel Strip. J. A. Ashworth. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 30-37; discussion p. 38.

Test method by which the across-grain core loss may be measured in Si-steel strip when the standard ASTM method cannot be applied. Utilizes a modified Epstein method.

9-221. D-C. Permeability Testing of Epstein Samples with Double-Lap

Joints. D. C. Dieterly. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 39-57; discussion p. 58-62.

Experimental tests which demonstrate that the d.c. permeability test on Epstein samples can be made very accurately, even at inductions normally considered too low for accurate testing in any commercial permeameter.

9-222. A New D-C. Permeameter. W. J. Carr, Jr. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 63-79; discussion p. 80-81.

A new type of d. c. permeameter for testing soft magnetic material, in which tests can be made on single strips and rods much shorter than required heretofore.

9-223. The Testing of Magnetic Recording Media. D. E. Wiegand. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 141-152; discussion p. 153.

Listening tests, measurement of final performance characteristics, and measurement of basic magnetic properties. Built-in calibration and positive means of compensation allow accuracy comparable to that of the ballistic galvanometer method, with great savings in time.

9-224. Resistance of Metals to Deformation at Rates of 10^{-6} to 10^{2} M. per Sec. I. (In Russian.) F. F. Vitman, N. A. Zlatin, and B. S. Ioffe. **II.** F. F. Vitman, and N. A. Zlatin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 300-326.

Simple method and apparatus for investigating the relationship of deformation resistance to deformation rate. Data for Pb, Al, Cu, mild steel, and duralumin. Results indicate the existence of three different regions within the above range of rates of deformation, in which the character of the deformation process is fundamentally different from the other two. 27 ref.

9-225. Formation of Residual Stresses of the First Order During Tensile Stress. II. Problem of the Presence of a Weakened Surface Layer. (In Russian.) L. A. Glikman, T. P. Sanfirova, and V. A. Stepanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 327-335.

Studied using an accurate method of testing on various shapes of test specimens. The appearance of residual stress during testing of specimens of carbon steel above their yield point. By analysis of the results, the existence of thin weakened surface layers was established.

9-226. Problem of Hertz and the Brinell Test. (In Russian.) G. P. Zaitsev. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 336-346.

A formula correlating the formulas of Hertz and Meyers. Because of the closed relationship of the parameters of elasticity and plasticity, the formula of Hertz and the modified formula give the same results when the maximum diameter of the imprint represents maximum elastic and minimum plastic imprint.

9-227. Plotting of Diagrams of True Stresses on the Basis of Hardness and Technological Tests. (In Russian.) M. P. Markovets. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 371-382.

Problem was investigated theoretically and experimentally for ferrous and nonferrous metals. Analysis of the diagrams resulted in establishment of a relationship between diameter of ball impression and degree of deformation during tensile test. A new method of plotting true-stress diagrams from yield point to fracture, on the basis of hardness determinations and tensile-test data.

9-228. Micromechanical Method for Investigation of Materials. (In Russian.) I. M. Roitman and Ya. B. Fridman. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 421-430.

Newly developed method and apparatus for micromechanical testing of materials (tensile, bending, torsion, and shear tests).

9-229. Investigation of Deformation Condition with Assistance of Rolled-On Indexing Grids. (In Russian.) T. K. Zilova and Ya. B. Fridman. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Mar. 1949, p. 431-440.

New simplified method for investigating local plastic deformations by transfer of mesh designs onto polished test specimens. Experiments on Cr steel and pure Al, differently heat treated, indicate applicability of this method. Results.

9-230. Una macchina per prove di fatica a flessione rotante; lavorazione e misura delle provette. (Rotating-Beam Fatigue-Test Machine; Preparation and Measurement of Test Specimens.) G. Bedeschi. *Alluminio,* v. 18, Mar.-Apr. 1949, p. 139-146.

An improved rotating cantilever-beam machine operating at high velocities, particularly adaptable for

testing light alloys. A special method for preparing test specimens is indicated. Formulas for calculation of applied stress.

9-231. Determination of Hardness on the Rockwell Apparatus Using a Pyramidal Point. (In Russian.) V. K. Grigorovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 572-575.

Proposes use of pyramided instead of conical points or steel balls. This permits establishing a direct relationship between Rockwell and Vickers hardness values without complicated calculations.

9-232. Method of Investigation of the Characteristics of Steel Fractures. (In Russian.) B. S. Natapov. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 15, May 1949, p. 576-580.

Various methods. Importance of determination of the crystal structure of the fracture zone and relationship to mechanical properties.

9-233. Method for Determination of Stresses in Cast Structural Elements. (In Russian.) Ya. A. Smolyanitskii. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 15, May 1949, p. 584-588.

Method using a dial-type instrument called the "optimeter". High sensitivity of this method in residual-stress determinations was confirmed experimentally.

9-234. Testing Ring-Shaped Specimens. (In Russian.) T. V. Aref'ev. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 15, May 1949, p. 589-594.

Proposed use for tensile testing. This method is suitable for determination of yield point, yield strength, and relative residual elongation and contraction. Test procedure and structural details of apparatus. Comparative data for ring-shaped and standard specimens.

9-235. Testing of Micro Tensile-Test Specimens. (In Russian.) E. M. Savitskii and V. P. Lebedev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 614-616.

Proposes use of very small test specimens (1 mm. in diameter), thus avoiding waste of critical material. The apparatus can be used for testing materials under tensile or compressive stresses. Structural details.

9-236. Furnace for Short and Long-Time Creep Tests at High Temperature. (In Russian.) A. V. Antonovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 618-621.

Method of operation. Electrical circuits for temperature regulation and for furnace heating.

9-237. A New Instrument for the Theoretical Determination of Stress Distributions in Flat Plates of Irregular Shape. Ch. Massonnet. *Engineers' Digest,* v. 10, July 1949, p. 233-237. Translated and condensed from *Revue Universelle des Mines,* ser. 9, v. 5, Feb., 1949, p. 41-51.

Instrument for a graphical and mechanical method. Theory and mechanical conversion, and examples.

9-238. Interferometric Examination of Hardness Test Indentations. S. Tolansky and D. G. Nickols. *Nature,* v. 164, July 16, 1949, p. 103-104.

By means of multiple-beam interference methods the authors are carrying out a systematic examination of the distortions produced on various surfaces by standard diamond hardness indenters. Preliminary observations made with a Vickers diamond pyramid and with a Rockwell cone on sintered tungsten carbide, on stainless steel, and a silver steel.

9-239. Measurement and Relaxation of Residual Stresses. W. Soete. *Welding Journal,* v. 28, Aug. 1949, p. 354s-364s.

See abstract from *Sheet Metal Industries,* item 9-179, 1949.

9-240. Proposed Revision of Tentative Recommended Practice for Tension Test Specimens for Copper-Base Alloys for Sand Castings; ASTM Designation: B 208-49T. *Foundry,* v. 77, Aug. 1949, p. 135-136.

9-241. PV Test Applied to Gearing Steel. J. G. Christ. *Iron Age,* v. 164, Aug. 11, 1949, p. 88-90.

A simple, inexpensive production-line method for determining the hardenability of shallow hardening steels. Application to medium-carbon gear steels.

9-242. Mesures des contraintes résiduelles a la surface des aciers cémentés et trempés. (Determination of Residual Stresses on the Surface of Sintered and Annealed Steels.) Jacques Pomey, Louis Abel, and Francois Goutel. *Comptes Rendus* (France), v. 228, May 16, 1949, p. 1565-1567.

Method. Schematic drawings indicate structural details of the apparatus used. Data of a typical determination.

9-243. (Book) **Symposium on Magnetic Testing, 1948.** 198 pages. 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. (Special Technical Publication No. 85.)

Introduction by P. H. Dike plus 10 papers and accompanying discussion presented at 51st annual

ASTM meeting, June 22, 1948. Individual papers are abstracted separately.

9-244. (Book) **Symposium on Deformation of Metals as Related to Forming and Service.** 117 pages. 1948. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. (Special Technical Publication No. 87.)

Contains five papers which are separately abstracted.

9-245. **Testing of Bearing Materials.** M. M. Khrushchov. *Metal Progress*, v. 56, Aug. 1949, p. 238-239. Translated and condensed.

Previously abstracted from *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk*, item 9-104, 1949.

9-246. **Hot-Spin Tests of Bladed Jet-Engine Rotors.** H. B. Saldin and P. G. DeHuff, Jr. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 605-612.

Four-bladed disks were tested in an apparatus designed to spin the rotors in as near engine operating conditions as possible, in accordance with a predetermined schedule of temperature gradient, temperature, and speed. Test results are analyzed.

9-247. **Comparison of High-Temperature Alloys Tested as Blades in a Type B Turbosupercharger.** W. C. Stewart and H. C. Ellinghausen. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 613-620.

Previously abstracted from *American Society of Mechanical Engineers*, Paper No. 48-A-96, 1948. See item 9-62, 1949.

9-248. **Changes in Internal Damping of Gas-Turbine Materials Due to Continuous Vibration.** G. B. Wilkes, Jr. *Transactions of the American Society of Mechanical Engineers*, v. 71, Aug. 1949, p. 631-634; discussion p. 634.

Previously abstracted from *American Society of Mechanical Engineers*, Paper 48-A-95, 1948. See item 9-61, 1949.

9-249. **Designing Cast Iron Crankshafts and Center-Frames for Diesel Engines.** T. O. Kuivinen. *American Foundryman*, v. 16, Aug. 1949, p. 28-32.

Use of stresscoat and electrical-resistance strain gages. Shows savings of 53% in costs as compared to a welded steel frame. Weight was reduced 14%. Design details and stress-analysis techniques.

9-250. **Temperature and Metals.** F. C. Lea. *Edgar Allen News*, v. 28, July 1949, p. 325-329.

Effect of temperature on certain properties of metals with particular reference to creep. Creep testing equipment and typical data. (To be continued.)

9-251. **Essais des matériaux dans l'industrie métallurgique. IV. Tache, importance et principaux procédés de recherches . . . Die Materialprüfung in der Metallindustrie. IV. Aufgaben, Bedeutung und wichtigste Untersuchungsverfahren.** (Materials Testing in the Metal Industry. IV. Problems, Significance, and Principal Testing Methods.) A. Meyer. *Pro-Metal*, v. 2, June 1949, p. 396-405.

Concludes illustrated survey.

9-252. **Bemerkung zum Steilabfall der Schlagbiegezähigkeit von Zinklegierungen.** (Remarks on the Sudden Drop in the Impact-Bending Strength of Zinc Alloys.) Nikolaus Ludwig. *Zeitschrift für Metallkunde*, v. 40, June 1949, p. 219-220.

Correct determination requires testing at temperature intervals considerably smaller than the usual 20° C. The drop depends on the alloy as well as on the shape of the specimen.

9-253. **Some Measurements of Hardness of Metals Using a Microhardness Tester.** (In Japanese.) M. Okada, Y. Kuriyama, T. Kitani, and K. Uemura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 29-33.

Use of tester and results of typical measurements.

9-254. **Application of SR-4 Strain Gages to Creep Testing.** *Testing Topics*, v. 4, June, July, Aug. 1949, p. 4-5.

Offer a convenient, simple, accurate, and sensitive means of measuring room-temperature creep of metals and alloys in the laboratory. Experimental procedure followed in the work at the Bureau of Mines.

9-255. **Reducing Cost of Fatigue Testing.** Hanns J. Maier. *Machine Design*, v. 21, Sept. 1949, p. 137-139.

Accelerated fatigue testing apparatus and procedure. The apparatus is basically a rotating cantilever-beam machine.

9-256. **30-Ton Universal Testing Machine.** *Engineering*, v. 168, Aug. 12, 1949, p. 165-167.

Machine for investigating the properties of special high-tensile steels (90-100 tons per sq. in.) in tubular and flat form.

9-257. **Relation entre les résultats donnés, par différents essais d'emboutissage effectués sur des toles d'alliage léger et le comportement de ces toles en atelier.** (Relation Between Results Obtained From Different Deformation Tests on Light-Alloy Sheets and Behavior of Such Sheets in Service.) L.

Beaujard. *Revue de Métallurgie,* v. 46, May 1949, p. 287-290.

Five different test methods (Ericksen, Guillery, Persoz, Jovignot, and "KWI") were investigated. Results indicate superiority of the latter.

9-258. Determination of Number of Revolutions of High-Speed Centrifugal Ram-Impact Machines and Work Expended in Fracture of Test Specimens. (In Russian.) P. G. Korolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 723-729.

Method and apparatus. Comparatively high friction in the ram supports does prevent its use for determination of impact strength at high rates of impact.

9-259. Production of Deformed Test Specimens From Intermetallic Compounds. (In Russian.) E. M. Savitskii, V. V. Baron, and M. A. Tylkina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 729-732.

Method and apparatus for production by hot pressing and hot extrusion. Shows that the concept of intermetallic compounds as brittle substances is correct only over a definite temperature range, and that such compounds behave as plastic substances under certain conditions. Deformed test specimens of the intermetallic compounds MgZn, $MgZn_2$, and $MgZn_5$ and of the intermetallic β and γ phases in the Al-Mg system with different concentrations of components were obtained.

9-260. New Testing Machines for Determining Mechanical Properties of Materials. (In Russian.) Kh. N. Dement'ev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 733-736; discussion, p. 736-737.

Describes new machine developed by Soviet engineers for tensile testing up to 5 tons, and also a hydraulic test machine for loads up to 50 tons.

9-261. Problem of Determination of Plasticity by Rolling Onto a Wedge. (In Russian.) Yu. M. Chizhikov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 737-739.

Method applicable to metals and alloys. It was found that plasticity of cast metal at high temperatures is lower than plasticity of metal of same composition which has previously been rolled. Stainless steel and other Cr-Ni steels were tested.

9-262. Über Schlagversuche an Flussstahlproben mit allgemeinen Folgerungen für Untersuchungen an stossartig beanspruchten festen Stoffen. (Impact Tests on Ingot Steel Specimens With General Conclusions on the Behavior of Solids Subjected to Impact-Like Stresses.) K. Fink. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, July 1949, p. 193-214.

Carbon steels were subjected to impact tension and compression testing. Results indicate that the evaluation must consider the propagation of the impact waves even at impact velocities produced by the ordinary pendulum-type impact testing machine. A method using central impact on cylindrical bars, with stress and strain measurements made by resistance gages, is proposed. 25 ref.

9-263. Über die Tiefziehfähigkeit von Blechen und ihre Bestimmung. (The Deep Drawing Properties of Metals and Their Determination.) E. Mohr. *Metall,* Dec. 1948, p. 405.

Shows in what respects Erichsen's deep drawing test fails to be universally applicable.

9-264. A New Scale of Hardness. G. B. Smith. *Engineer,* v. 188, Aug. 26, 1949, p. 235.

Advantages of new Russian scale over the Mohs and Knoop scales. No standards are required, since the hardness numbers are derived from experimental values expressed in kg. per sq. mm. Comparative values for different materials are tabulated.

9-265. Fatigue Under Combined Pulsating Stresses. H. Majors, Jr., B. D. Mills, Jr., and C. W. MacGregor. *Journal of Applied Mechanics,* v. 16 (*Transactions of the American Society of Mechanical Engineers,* v. 71), Sept. 1949, p. 269-276.

Special combined-stress pulsator used to subject thin-walled cylindrical tubes to various ratios of combined (in phase) pulsating stresses. The material investigated was annealed SAE 1020 steel. Tension tests and uniaxial completely reversed rotating bending fatigue tests were made in the axial and tangential directions to study anisotropy. 13 ref.

9-266. Investigation of State of Stress of Transparent Three-Dimensional Models in a Beam of Parallel Rays of Polarized Light. (In Russian.) N. I. Prigorovskii and A. K. Preiss. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), May 1949, p. 686-700.

Method using plates, cut from three-dimensional models, which are "chilled" under load. Each point of such a plate, retaining elastic deformation obtained during stressing of the model, is assumed to be an optically anisotropic crystal. Optical properties of such plates are related to their state of stress and permit

determination of direction and size of the three main stresses acting at any point. Includes experimentally verified simplifications applicable to standard machine parts.

9-267. A Quench Cracking Susceptibility Test for Hollow Cylinders. Cyril Wells, C. F. Sawyer, I. Broverman, and R. F. Mehl. *American Society for Metals,* Preprint No. 13, 1949, 28 pages.

Notched specimens 6.5 in. o.d., 2.75 in. i.d., and 0.5 in. thick are spray-quenched in a special way, and minimum depth of notch required to crack specimens is determined. The minimum varies inversely with cracking susceptibility. As an index of cracking susceptibility, the test is already extensively employed in a variety of studies. Possible modifications to increase range of usefulness. 15 ref.

9-268. A Bar Bend Test and Its Application to Stainless Steel. C. A. Zapffe, R. L. Phebus, and F. K. Landgraf. *American Society for Metals,* Preprint No. 24, 1949, 20 pages.

Bend-testing machine for rod and bar based on the principles of the single-bend constant-rate test previously described for wire. An exploratory survey of most of the standard grades of commercial stainless steels discloses those compositions and conditions which are sensitive to the test. Results for types 403, 410, 414, 416, 420, 431, 440-B, and 440-C. Behaviors are illustrated for retained austenite, secondary hardening, and retempering. Rockwell hardness readings are also compared with the bend plots.

9-269. Investigation of Square Sub-Sized V-Notched Charpy Specimens. Donald C. Buffum. *ASTM Bulletin,* Sept. 1949, p. 45-47.

Impact data over a range of temperatures are presented for standard and for several subsized specimens. Data are for one steel which has been given a single heat treatment. Effects of reduction in cross-sectional area and of small changes in the notch upon temperature of transition from ductile to brittle fracture.

9-270. A Torsion Testing Machine of 2,000,000 Inch-Pound Capacity. F. K. Chang, K. Endre Knudsen, and Bruce G. Johnston. *ASTM Bulletin,* Sept. 1949, p. 49-52.

Machine designed and constructed at Lehigh University. It can test specimens up to 4 ft., 4 in. in diameter by 16 ft. long; and can apply twists through any desired angle.

9-271. The Creep of a Nominally Isotropic Aluminium Alloy Under Combined Stress Systems at Elevated Temperatures. A. E. Johnson. *Metallurgia,* v. 40, July 1949, p. 125-139.

Creep, plastic strain and relaxation tests at high temperatures, and under general stress systems being carried out in the National Physical Laboratory, England. Tests were performed on Al (R.R.59) alloy at 150 and 200° C. Results are analyzed and equations for the stress-strain relations are derived. 16 ref.

9-272. Fatigue Tests of Spot-Welded Steel Sheets. Georges Welter. *Welding Journal,* v. 28, Sept. 1949, p. 414s-438s.

Comprehensive review of a series of fundamental experiments to determine the method of fatigue failure of spot welds in mild and stainless steel sheets.

9-273. The Static Notch-Bar Tensile Test. G. Fitzgerald. *Aircraft Engineering,* v. 21, Sept. 1949, p. 301.

A series of tests on four different steels enables a comparison to be made between the static notched-bar tensile test figures and tensile strength and Brinell hardness figures obtained on standard machines.

9-274. Metal Hardness Tests. [A. P. Gulyaev and R. I. Mitel'berg.] *Chemical Age,* v. 61, Sept. 3, 1949, p. 323-324.

Previously abstracted from *Zavodskaya Laboratoriya* (Factory Laboratory). See item 9-194, 1949.

9-275. The Theory of Ultrasonic Materials Testing. H. E. Van Valkenburg. *Mechanical Engineering,* v. 71, Oct. 1949, p. 817-820.

Basic characteristics of ultrasonic waves. Potentialities and limitations of application to materials testing. 13 ref.

9-276. Analyzing Mechanical Failures. Kenneth N. Mills. *Product Engineering,* v. 20, Oct. 1949, p. 114-118.

Analysis procedures and latest equipment for testing materials as basis for sound practice in part design. Photo-elastic analysis and bearing failure analysis.

9-277. Buckling of Uniform and Stepped Columns. I. J. H. Meier. *Product Engineering,* v. 20, Oct. 1949, p. 119-123.

Procedure for more accurate analysis than is obtained with handbook formulas. Application to cylinder and piston-rod assemblies.

9-278. The Development of a Permanent Mold for Aluminum Tensile Test Bars. L. J. Ebert, R. E. Spear, and G. Sachs. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 315-330; discussion, p. 330-333.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-13. See item 9d-4, 1948.

9-279. Can Castings Be Engineered? F. G. Tatnall. *Transactions of the*

American Foundrymen's Society, v. 56, 1948, p. 452-456; discussion, p. 456-457.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-45. See item 24a-109, 1948.

9-280. A Fluidity Test for Aluminum Casting Alloys. W. E. Sicha and R. C. Boehm. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 502-506; discussion, p. 506-507.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-34. See item 9d-3, 1948.

9-281. Production Hardness Testing in a Malleable Shop. C. Schneider and L. Ulsenheimer. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 580-584; discussion, p. 584-585.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-25. See item 9b-25, 1948.

9-282. Application of the Brinell Test in the Foundry. J. Léonard. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A211-A213; discussion, p. A213-A214.

Previously abstracted from *Foundry Trade Journal.* See item 9b-39, 1948.

9-283. Creep. P. S. Wakefield. *Machinery Lloyd* (Overseas Edition), v. 21, Sept. 24, 1949, p. 68-69, 71, 73.

Phenomenon of creep, its testing, and practical applications of creep-test results.

9-284. What Do Materials Tests Really Tell the Designer? H. W. Gillett. *Machine Design,* v. 21, Oct. 1949, p. 96-102, 154.

Limitations of the various materials test data for predicting actual service behavior. No single test gives wholly reliable design indications. The engineer must still exercise engineering judgment. Tendency toward use of simulated service tests.

9-285. Werkstoffprüfung und Festigkeitsberechnung (Gestaltfestigkeit). (Materials Testing and Strength Calculations—Design Stability.) G. Fiek. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 271-273.

Assumptions of uniform distribution of stresses as determined on simple geometrical test bars are found to be erroneous when the shape of structural parts is altered by notches, holes, and changes in their cross-sections. Test results have shown that the strength properties of a given material depend not only on its composition, phase structures, etc., but also on its shape, size, and surface condition. 14 ref.

9-286. Strain Measurements on Rotating Parts. R. E. Gorton and R. W. Pratt. *SAE Quarterly Transactions,* v. 3, Oct. 1949, p. 540-556.

Previously abstracted from condensed version in *SAE Journal.* See item 9-118, 1949.

9-287. Problems of Aircraft Life Evaluation. Joel M. Jacobson. *SAE Quarterly Transactions,* v. 3, Oct. 1949, p. 616-629; discussion, p. 629-633.

Fatigue information as it applies to life expectancy calculations for aircraft. The number of factors and the lack of data, as well as of a definite theory, make it impossible to do more than make a reasonable guess of life expectancy. Repeated load tests still appear to be the most satisfactory method of ensuring safe life expectancy.

9-288. Tests Bars; Towards Standardization for Copper-Base Alloys. V. Kondic. *Metal Industry,* v. 75, Oct. 7, 1949, p. 283-286.

The present status of test-bar practice; unsolved problems in casting and using test bars, and in interpreting test-bar results. 16 ref.

9-289. A Microhardness Tester for Use With an Inverted Microscope. G. H. Townend. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Sept. 1949, p. 295-296.

Some general aspects of microhardness-tester design and an instrument compatible with the conclusions reached. An example of its use.

9-290. The Mode of Fracture at the Neck of a Tensile Specimen. W. I. Pumphrey. *Proceedings of the Physical Society,* v. 62, sec. B, Oct. 1, 1949, p. 647-651.

Bridgman has shown that in a cylindrical specimen deforming plastically under longitudinal tension, tensile stress at the neck of the specimen is greatest on the longitudinal axis and least at the periphery of the specimen. Fracture therefore commences at the center and extends to the periphery. "Double-cup" fractures encountered during tensile testing of a number of alloys at elevated temperatures were accounted for in this way. Metallurgical factors which govern occurrence of this type of fracture are examined.

9-291. Hardness Testing. Reginald S. Bruce. *Edgar Allen News,* v. 28, Sept. 1949, p. 373-376; Oct. 1949, p. 410-411.

Equipment and procedures.

9-292. Die Entwicklung der Setzdehnungsmesser an der Materialprüfungsanstalt Stuttgart. (Development of an Extensometer at the Materials Testing Institute in Stuttgart.) S. Schwaigerer. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 307-308.

Instrument developed to measure internal stresses in the vicinity of

welds. It can also be used to measure extension under stress.

9-293. Quick-Selection Chart for "SR-4" Strain-Gage-Type Pick-Ups. G. L. Rogers. *Instruments,* v. 22, Oct. 1949, p. 912.
Includes numerical example.

9-294. Testing Materials at High Temperature. F. G. Tatnall. *Mechanical Engineering,* v. 71, Nov. 1949, p. 906-910.
Short-time stress-strain, stress-rupture, creep, relaxation, and fatigue tests.

9-295. Some Transverse Tests on Meehanite Iron Beams. Oliver Smalley. *Iron Age,* v. 164, Nov. 10, 1949, p. 83-86.
A series of tests utilizing a strain-gage technique. The material appears to obey Hooke's law in bending up to about 30% of the ultimate load, and at moderate loads, modulus of elasticity is the same in tension and compression.

9-296. Some Experiments on the Bursting of Spherical Rotors by Centrifugal Forces. J. W. Beams. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 1-6.
Steel rotors of various sizes are spun to speeds where explosion occurs. The stresses developed are calculated by Chree's method. Application of technique to other problems.

9-297. Electric Resistance Changes of Fine Wires During Elastic and Plastic Strains. E. W. Kammer and T. E. Pardue. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 7-20.
Investigated for Fe, Ni, Pt, and 15 alloys used in the construction of bonded-wire strain gages. Description of apparatus. 13 ref.

9-298. BL-310. "Strain Analyzer". Dean Christian. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 21-29.
Problems involved in the design of a complete strain-gage recording system capable of making instantaneous recordings of static strains, and of dynamic strains up to 120 cycles per sec. The instrument and its characteristics, use, and the resulting chart record. Includes circuit diagrams.

9-299. Tests of a Railroad Bridge With a Mechanical Oscillator. E. J. Ruble. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 31-44.
Tests were conducted on a truss span in order to determine the separate effect of unbalanced forces in locomotive driving wheels and to study the damping of the structure. Design and construction of the oscillator used to excite motion.

9-300. A Biaxial Stress Machine for the Determination of Plastic Stress-Strain Relations. Joseph Marin. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 71-82.
Strains were measured in the plastic range by specially designed electric SR-4 clip gages. Yield strength, ultimate strength, ductility, and plastic stress-strain relations were determined for Alcoa 24S-T tubular specimens subjected to biaxial tensile stresses.

9-301. Fatigue Life of Rail Webs in Service. C. J. Code and A. E. F. Billstein. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 103-116.
Rail failure. Field measurement of stresses and laboratory fatigue studies. Redesign.

9-302. Large-Scale Torsional Fatigue Testing of Marine Shafting. S. F. Dorey. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 46, 1948, p. 399-406; discussion, p. 407-415.

Design and construction of a new testing machine of the resonance type capable of generating a reversed harmonic torque of up to $\pm 3 \times 10^6$ lb.-in. in a stationary test shaft, at a frequency of approximately 2,500 vibrations per min. A specially developed electronic method of speed control is capable of regulating the nominal stress in the specimen to within 1%. Results of a number of fatigue tests on 9¾-in. diam. mild steel shafts, and also on "Meehanite" cast-iron specimens 6 in. in diam.

9-303. Fatigue Tests With Stress Cycles of Varying Amplitude. G. Wallgren. *Aeronautical Research Institute of Sweden* (Stockholm), Report No. 28, 1949, 34 pages.

Tests were made with elements of 24S-T and 75S-T Alclad and of Cr-Mo steel, which consisted of unnotched sheet specimens, specimens notched by drilled holes, and riveted joints. Loads were varied according to two different load spectra representing stresses due to gust and maneuvering loads of aircraft wings. Validity of the cumulative damage theory which states that failure will occur when the sum of all part damages equals unity. 14 ref.

9-304. Influence of Size of Test Specimen on Notch Sensitivity of Steels and Light Alloys. (In Russian.) S. E. Belyaev. *Zavodskaya Laboratoriya*

(Factory Laboratory), v. 15, July 1949, p. 821-828.

Influences of length and diameter of test specimen, of temperature of annealing, and of degree of curvature, if any, on accuracy of determination of yield strength by tensile test. Comparative data for different steels and alloys are tabulated and charted.

9-305. Investigation of Hardness by an Indentation Method. (In Russian.) I. L. Mirkin and S. I. Novak. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 835-841.

Use of irregular loading in hardness tests. The relationship of diameter of indentation to load, for all the metals tested, obeyed an exponential law beginning with loads at which elastic deformation of the ball and the material no longer play an essential role. Limits of applicability of steel balls and balls of hard alloys. Test data on several Armco irons, a high-chromium alloy, and duralumin.

9-306. Long-Time Hardness Tests. (In Russian.) A. P. Gulyaev and E. F. Trusova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 842-844.

Method using a Brinell tester, in which the ball is pressed into the specimen at high temperatures for an extended period of time (30 sec., 10 min., 30 min., etc.). Method was applied to study of the influence of alloying elements (0.5, 1.0, 2.0, 3.0, and 5% Zn or Mg) on the properties of solid solutions of Al-Zn or Al-Mg. Inapplicability of the method to determination of heat resistance.

9-307. Apparatus for Determination of Wear of Shaft Bearings. (In Russian.) A. S. Livshits and M. I. Shchepak. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 876-878.

Simple apparatus, including a recording pen.

9-308. Creep-Testing Machine. (In Russian.) Yu. S. Gintsburg and N. D. Zaitsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 878-882.

Newly developed creep-test machine designed for mass screening tests of alloys and for high-temperature tests in creep, continued to rupture. This machine tests alloys designed for use at temperatures up to 1100° C. Maximum tensile load is 750 Kg. Limits of creep may be determined at deformations of the order of 10% per hour.

9-309. Photoelasticity Procedure Is Simplified With Diffused-Light Polariscope and Prepolished Materials. August J. Durelli and Rex L. Lake. *Machine Design*, v. 21, Nov. 1949, p. 137-141.

Theoretically, the photo-elastic method of stress analysis is capable of producing precise results by simple means. In practice, however, attainment of precision has been possible only with the aid of a costly optical setup and extremely complicated techniques. A diffused-light polariscope and some simplified techniques.

9-310. Hardness Testing With Precision Indenter. *Machine Design*, v. 21, Nov. 1949, p. 146-147.

A commercially available instrument.

9-311. Perforated Cover Plates for Steel Columns. *Technical News Bulletin* (National Bureau of Standards), v. 33, Nov. 1949, p. 133-134.

Methods used for study of mechanical properties of perforated-steel cover plates for bridge columns, utilizing full-scale models.

9-312. Der Einfluss einer tiefenabhängigen Spannungsverteilung auf die röntgenographische Spannungsmessung. (Effect of a Depth-Dependent Stress Distribution on X-Ray Stress Measurements.) Eugen Osswald. *Zeitschrift für Metallkunde*, v. 39, Sept. 1948, p. 279-288.

Equations applicable to the case in which magnitude of stress varies with distance from the surface. Inhomogeneously distributed stresses determined by different methods are correlated with respective positions in the stress field. Method of converting apparent stresses to actual stresses.

9-313. Method of Fatigue Testing of Metals Using a Three-Roll Machine. (In Russian.) M. M. Khrushchov and M. A. Babichev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 962-967.

The method is particularly recommended for bimetallic test specimens, in which a nonferrous more plastic metal forms a thin layer on the inside surface of a steel ring. Method of determining endurance limit.

9-314. Influence of Method of Notching on Impact-Strength Characteristics. (In Russian.) S. K. Maksimov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 967-971.

Impact strength is greatest when the notch is drilled, intermediate when it is formed by abrasion, and least when cut. Data are tabulated and charted for 0.17-0.30% C steels.

9-315. Method of Determination of Fatigue Strength Under High Stresses.

(In Russian.) S. L. Zhukov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 971-976.

Two Shenk machines are used for fatigue testing in bending and torsion. Both machines permit determination of fatigue strength at stresses near the endurance limit. Typical data for steel.

9-316. Centrifugal Method for Testing Metals and Alloys at High Temperatures. (In Russian.) M. E. Rabinovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 988-993.

Investigation of heat resistance of alloys of the Al-Cu-Mn-Zn system at 300° C. Influence of Zn addition to the ternary system.

9-317. Testing Gun Steel and Other Alloys and Metals for Resistance to Surface Cracking. E. Ingerson. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 176, 1948, p. 477-489; discussion, p. 489.

Previously abstracted from *Metals Technology*. See item 9-138, 1947.

9-318. Dynamic Strain-Gaging of Seamless Steel. *Iron Age*, v. 164, Nov. 17, 1949, p. 85.

Use to determine instantaneous loads while seamless steel tubing was being rolled in the high-mill after piercing. In another instance, strains and stresses occurring during assembly of a drill-pipe joint and while it was being tested were determined. Similar data were obtained for a threaded bell-joint casing while the joint was pulled in tension to destruction.

9-319. "Transition" Temperatures Under Various Amounts of Plastic Flow. N. Grossman and C. W. MacGregor. *Welding Journal*, v. 28, Nov. 1949, p. 551s-555s.

Four hot-rolled, low-carbon steel plates were used to study the relationship between angle of bend and permanent deflection preceding the fracture of notched-bar specimens. The tests were conducted isothermally at constant deflection rate. Results indicated that transition temperatures are functions of geometries as well as of materials; and that at a permanent angular bend of ½° the testing temperature at fracture for the notch geometries investigated was about 100° F. above the respective brittle transition temperatures used in the M.I.T. test.

9-320. Speed of Loading in Tensile Testing of Cast Iron. *Foundry Trade Journal*, v. 87, Nov. 10, 1949, p. 573-574. Translated and condensed from paper by M. Gelain.

Effects of loading speeds on tensile strengths of high-strength cast iron.

9-321. The Measurement of Changes in Length With the Aid of Strain Gauges. A. L. Biermasz and H. Hoekstra. *Philips Technical Review*, v. 11, July 1949, p. 23-31.

Apparatus, principles, techniques, and applications.

9-322. Considérations d'ensemble sur le problème de la décohésion. (General Discussion of the Problem of Failure.) W. Soete. *La Metallurgia Italiana*, v. 41, July-Aug. 1949, p. 175-180.

The problem of brittle fracture and criteria for choice of test methods. A static bending test on a notched bar is proposed. Factors which affect various phases of the test—crack formation and its propagation—and criteria for evaluation of the results are studied.

9-323. Installation of Strain Gages on Pressure Vessels. *Product Engineering*, v. 20, Dec. 1949, p. 143-144. Condensed from "Application of Electrical Resistance Strain-Gages", by A. L. Tannahill.

Previously abstracted from *Engineer*. See item 9-188, 1949.

9-324. Biaxial Tension-Tension Fatigue Strengths of Metals. Joseph Marin. *Journal of Applied Mechanics*, v. 16 (*Transactions of the American Society of Mechanical Engineers*, v. 71), Dec. 1949, p. 383-388.

See abstract from *Proceedings of the Society for Experimental Stress Analysis*, item 9-300, 1949.

9-325. An Automatic Recording Apparatus for the Study of Flow and Recovery in Metals. E. N. Da C. Andrade and A. J. Kennedy. *Proceedings of the Physical Society*, v. 62, sec. B, Nov. 1, 1949, p. 669-675.

Apparatus which records continuously on photographic paper the extension-vs.-time curve of a metal wire under stress. Deformation of the paper during development and drying does not affect accuracy. The apparatus also automatically removes and restores the load, repeatedly if desired, at predetermined times.

9-326. An Investigation of the Mechanical Properties of Materials at Very High Rates of Loading. H. Kolsky. *Proceedings of the Physical Society*, v. 62, sec. B, Nov. 1, 1949, p. 676-700.

Method of determining the stress-strain relation of materials when stresses are applied for times of the order of 20 microsec. The apparatus is a modification of the Hopkinson pressure bar, and detonators are used to produce large transient stresses. Thin specimens of rubbers, plastics, and metals were investigated. The phenomenon of delayed recovery is discussed in terms of the

theory of mechanical relaxation and memory effects in the material.

9-327. Micro-Hardness Testing; Design and Construction of a Simple Instrument. H. A. Unckel. *Metal Industry,* v. 75, Nov. 18, 1949, p. 431-432.

The majority of microhardness testers are relatively complicated and applicable only to the inverted type of microscope. The instrument described can be used with both the inverted and the ordinary table-type microscope.

9-328. Tests of an Aluminum Alloy Gasoline Transport Semi-Trailer. J. H. Dunn and R. L. Moore. *Automotive Industries,* v. 101, Dec. 1, 1949, p. 35, 72.

Results of static-load tests using strain gages.

9-329. A 1000-Ton Horizontal Structure-Testing Machine. *Engineer,* v. 188, Nov. 18, 1949, p. 576-579.

Machine intended for research on the strength of structural components of aircraft.

9-330. Strain Measurement by X-Ray Diffraction Methods. G. B. Greenough. *Aeronautical Quarterly,* v. 1, Nov. 1949, p. 211-224.

Principles of the method. Types of stress and strain systems existing in polycrystalline metals are considered, particular attention being paid to the effect of elastic and plastic anisotropy of individual crystals. Possible modifications of earlier methods of interpreting the measurements. 16 ref.

9-331. Nouvelle méthode dynamique pour la mesure des constantes d'élasticité. (A New Dynamic Method for Measurement of Elastic Constants.) R. Cabarat. *Revue de Métallurgie,* v. 46, Sept. 1949, p. 617-621.

Method is characterized by high precision and by the fact that vibrations are produced and their amplitude measured by means applicable to any solid substance in a wide temperature range (at least up to 800 °C.)

9-332. Application of Centrifugal Force to Investigation of the Mechanical Strength of Metallic Systems. (In Russian.) I. I. Kornilov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 11, 1949, p. 843-846.

Proposes a new method for tensile and bending tests, based on the application of centrifugal force, for use at temperatures up to 900 °C.

9-333. Mechanical Testing at High Temperatures. H. E. Gresham. *Metal Industry,* v. 75, Dec. 2, 1949, p. 471-474.

Methods and equipment.

SECTION X

ANALYSIS

10A—General

10A-1. Colorimetric Determination of Iron With Isonitrosodimethyldihydroresorcinol. Sudhir Chandra Shome. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1205-1208.

Spectrophotometric study of the color reaction between the above reagent and iron (ferric or ferrous ion) indicates its suitability. Iron is estimated in the presence of comparatively large amounts of Ni, Co, phosphate, arsenate, fluoride, oxalate, citrate, tartrate, borate, perchlorate, etc., in slightly acid medium. It can be detected in amounts as small as one part in 50,000,000 parts of solution.

10A-2. Rapid Quantitative Analysis by X-Ray Fluorescence Method. Marcel A. Cordovi. *Steel,* v. 123, Dec. 20, 1948, p. 88-92, 94.

Results of experiments indicate that a few modifications in present design will bring accuracy within limits required for routine quantitative chemical analysis of metals.

10A-3. Rapid Test for Small Concentrations of Cadmium in Zinc Solutions. R. S. Young and C. W. Barker. *Chemist Analyst,* v. 37, Dec. 1948, p. 81, 83.

Method used in the zinc industry to determine completeness of removal of cadmium from $ZnSO_4$ solution, prior to electrowinning of the latter, by agitating with zinc dust and filtering off the precipitated Cd and excess zinc dust. Addition of zinc dust and agitation is continued until the Cd content falls to a stipulated level.

10A-4. 2,2-Diquinolyl, a Specific Reagent for Copper. J. Hoste, *Research,* v. 1, Dec. 1948, p. 713-715.

The above compound forms a complex of a deep purple color with monovalent copper. It may be used for the spot-test identification of copper, the reaction being specific and highly sensitive. Both qualitative detection and colorimetric estimation of small quantities of copper, without preliminary separations, even in the presence of high concentrations of colored ions, such as those of Ni, Fe, and Co, are feasible.

10A-5. Influence of Complex Formation on Magnitude of Potential of Systems Having Analytical Significance. I. (In Russian.) V. S. Syrokomskii and V. B. Avilov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1151-1159.

Method and apparatus used. As an example, the influence of complex formation agents in the ferrous-ferric ion system was investigated. 15 ref.

10A-6. Colorimetric Determination of Mixtures of Two Colored Components. (In Russian.) A. K. Babko and M. M. Korsun. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1160-1170.

Reviews existing methods (chemical, spectrophotometric, and photocolorimetric) for the above. Means of simplifying the procedure, shortening the time of determination, and decreasing the cost. Comparative data for determination of Mn, Cr, and Fe are tabulated. 18 ref.

10A-7. New Rapid Method of Quantitative Phase Analysis. (In Russian.) L. G. Berg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1171-1175.

Methods and apparatus applicable to investigation of ores and mineral compounds (oxides and hydroxides). Results of typical analyses.

10A-8. Rapid Method of Direct Determination of Trivalent Iron by Titration With Mercurous Nitrate. (In Russian.) S. A. Babushkin and M. L. Pogrebinskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1182-1186.

The method is characterized by its

rapidity and convenience. It does not require use of an inert-gas atmosphere.

10A-9. Investigation of the Possibility of Simultaneous Determination of Nickel and Cobalt by Electrometric Titration. (In Russian.) V. G. Sochevanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1187-1194.

Experimental verification of the possibility of cyanometric determination of nickel and cobalt by noncompensating electrometric titration as described by Chirkov. Determination of Ni in the absence of Co gives reliable results. However, in the presence of Co, the reliability of the results is questionable. 10 ref.

10A-10. Determination of Magnesium, Molybdenum and Nickel by Polarometric Titration. (In Russian.) Z. S. Mukhina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1194-1198.

A new polarometric method characterized by its rapidity. Accuracy is sufficient for industrial application.

10A-11. Potentiometric Determination of Manganese in Manganous Ores, Ferromanganese, Nichrome, and High-Chromium Steels. (In Russian.) A. I. Busev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1198-1202.

Noncompensating potentiometric method, characterized by oxidation of bivalent to trivalent Mn, and applicable to concentrations of 0.1-90% Mn. The presence of other metals does not interfere.

10A-12. Uber die Verluste, die bei der Auflösung von Metallen und Legierungen entstehen. (Concerning Losses Resulting From the Solution of Metals and Alloys.) L. Hertelendi. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 115-127.

Analytical errors and several methods for minimizing them. 12 ref.

10A-13. Die Vorbereitung von Metall- und Legierungsmustern zur Analyse: Homogenisierung durch Zusammenschmelzen. (Preparing Samples of Metals and Alloys for Analysis: Homogenization by Fusion.) L. Hertelendi. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 129-140.

An experimental study of the melting of different metals and alloys together to insure homogeneity for analysis.

10A-14. Wirkung einiger Red.-Ox.-Systeme auf Kakothelin und Methylenblau. Anwendungen zum selektiven Nachweis von Thiosulfat. Kupfer. Eisen. Formaldehyd und von Oxydationsmitteln. (Action of Some Reduction-Oxidation Systems on Cacotheline and Methylene Blue. Application to Selective Identification of Thiosulfate, Copper, Iron, Formaldehyde, and of Oxidation Agents.) Rudolph Lang. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 167-178.

10A-15. Bericht uber die Fortschritte der analytischen Chemie. I. Allgemeine analytische Methoden, analytische Operationen, Apparate und Reagenzien. II. Chemische Analyse anorganischer Stoffe. (Report on Progress Made in Analytical Chemistry. I. General Analytical Methods, Analytical Operations, Apparatus, and Reagents. II. Chemical Analysis of Inorganic Substances.) A. Kurtenacker. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 313-360.

Part I describes and diagrams a number of new methods reported recently (within the last 5-10 years.) Part II reviews work on analysis of Be, Al, Mn, Mn bronzes, Co, Ni, and Ni bronzes. 230 ref.

10A-16. Simple Tests for Identifying Metals by Appearance, Chip Test, and Blowpipe Test. *Linde Tips,* v. 28, Jan. 1949, p. 12-13.

A table.

10A-17. Dosage du tantale et du niobium dans le ferrotantale, le ferroniobium et les aciers. (Determination of Tantalum and Columbium in Ferrotantalum, Ferrocolumbium, and Steels.) B. Emile Jaboulay. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 343-346.

New chemical analysis method for direct determination of the above. Theoretical bases and accuracy. Data for typical determinations.

10A-18. Chemical Analysis of Heat Treating Salts. Part I. Vincent C. Petrillo. *Steel Processing,* v. 34, Dec. 1948, p. 652-657, 666.

Development of accurate, precise, and rapid chemical methods for water-insoluble matter, chlorides, carbonates, and silica. 14 ref. (To be continued.)

10A-19 (Book). **Metallurgical Analysis. Ed. 2.** V. Gopalam Iyer. 612 pages. 1947. The Author, College of Mining and Metallurgy, Benares Hindu University, Benares, India.

States briefly the principle on which each determination is made and describes the anlytical procedure for acidimetry, alkalimetry, oxidation and reduction reactions, analysis of pig iron, carbon steel, alloy steels, nonferrous alloys, ore

assays, refractory materials, and ferro-alloys.

10A-20. First Annual Review of Analytical Chemistry. Fundamental Analysis. *Analytical Chemistry,* v. 21, Jan. 1949, p. 2-173.

Consists of 29 articles covering the past five years. 3814 ref.

10A-21. Polarographic Method for Copper, Lead, and Iron Using a Pyrophosphate Background Solution. C. A. Reynolds and L. B. Robers. *Analytical Chemistry,* v. 21, Jan. 1949, p. 176-178.

16 references.

10A-22. The Measurement of Magnetic Properties of Rocks. J. McG. Bruckshaw and E. I. Robertson. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 444-446.

Apparatus for the above; also one for determination of direction and intensity of residual magnetism. Such measurements are of value in determining the amounts of ferromagnetic mineral constituents present, such as magnetite, titanomagnetite, pyrrhotite.

10A-23. A General Method for Quantitative Spectrochemical Analysis. (Preliminary Communication). (In English.) N. W. H. Addink. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 690-696.

Two modifications of Harvey's method: one for rough estimation of element concentration and one for exact determination obtained by successive additions of the element being determined. Advantages of the new method.

10A-24. The Photometric Determination of Cobalt With Nitroso-R-Salt. (In English.) A. Claassen and W. Westerveld. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 720-724.

A wave-length of 550 m_{μ} is recommended, using absorption cells of 2-5 cm. length. Interference by Cu and Ni. Interference by other elements.

10A-25. The Separation of Tin (IV) and Antimony According to F. W. Clarke. I. Basis of the Method. (In English.) P. Karsten and H. L. Kies. *Recueil des Travaux Chimiques des Pays-Bas,* v. 67, Nov. 1948, p. 753-760.

Experimental and theoretical study of the stability of the oxalate complexes with respect to H_2S as a function of pH. Clarke's method (described in 1870) is still considered superior to other methods reported more recently. 15 ref.

10A-26. Le dosage ponderal du chrome (Etude des précipités a l'aide de la thermobalance de Chevenard). (Gravimetric Determination of Chromium. (Study of Precipitates by Means of the Chevenard Thermobalance.)). Thérese Dupuis and Clément Duval. *Comptes Rendus* (France), v. 227, Oct. 18, 1948, p. 772-774.

Existing gravimetric methods for the above were investigated in order to establish optimum procedures and also to determine the suitability of certain automatic techniques.

10A-27. Om användandet av räknebräden inom den kvantitativa spektralanalysen. (Calculating Boards in Quantitative Spectrochemical Analysis.) C. Georg Carlsson. *Jernkontorets Annaler,* v. 132, No. 11, 1948, p. 467-484.

Principles of some different types of calculating boards and of plate calibration by means of iron lines. Includes table of important lines.

10A-28. Sample Electrode Vapour Contamination of the Graphite Electrode in the Flat Surface Sparking Technique of Spectrochemical Analysis. (In English.) D. M. de Waal and S. M. Naude. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 127-140.

10A-29. Zur Spektrochemie der Metalloide F, Cl, Br, J, S, Se. (Spectrochemistry of the Metalloids F, Cl, Br, I, S, and Se.) A. Gatterer. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 214-232.

An easy and rapid method for qualitative and quantitative determination of the above. A tube of high-melting-point glass is charged with a small sample (10 to 20 mg.) and thoroughly evacuated. The spectra are excited without electrodes in a high-frequency magnetic field. The sensitivity limit is 0.001%, under favorable conditions, and quantitative determinations can be made down to 0.01% with an accuracy of 10%. Other advantages.

10A-30. Progress of Spectrochemical Analysis in Emission Spectroscopy up to 1943 in the U.S.S.R. (In English.) G. S. Smith. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 235-246.

A review. 28 ref.

10A-31. Versuche zur fällungsanalytischen Abscheidung bzw. Bestimmung des Mangans als Triwismutoxypermanganat $Bi_3O_5H_2MnO_4$. (Investigation of an Analytical Precipitation Method for Determination of Manganese as the Tribismuthoxypermanganate, $Bi_3O_5H_2MnO_4$.) Fr. Hein and D. Arvay. *Angewandte Chemie,* ser. A, v. 60, June 1948, p. 157-158.

10A-32. Application of Solid Electrodes for Polarographic Analysis. (In Rus-

sian.) S. K. Chirkov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1300-1306.

Technique and sphere of application as compared with the commonly used mercury-drop electrodes. Data from a typical determination.

10A-33. Application of Solid Electrodes in Polarography. IV. Rectilinearly Moving Solid Electrodes. (In Russian.) E. M. Skobets, I. D. Panchenko, and V. D. Ryabokon. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1307-1312.

Includes a schematic drawing of the apparatus developed, using solid needle-shaped electrodes; typical polarograms obtained and their interpretation.

10A-34. Method for Rapid Determination of Sulfuric Acid in a Chromium Electrolyte. (In Russian.) V. A. Il'in. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1389-1390.

Proposes a rapid method (10-15 min.) based on the electrochemical processes taking place during electrolysis.

10A-35. Ein neues Verfahren zur Sauerstoffbestimmung in Pulvern aus Weicheisen, Stahl und einigen anderen Metallen. (A New Process for Determining the Oxygen Content of Powders of Soft Iron, Steel, and Several Other Metals.) Gerhard Naeser. *Stahl und Eisen,* v. 69, Jan. 6, 1949, p. 19-22.

The proposed volumetric process is especially adapted for analyzing carbon-containing iron powder.

10A-36. The Spectrochemical Determination of Beryllium. L. T. Steadman. *U. S. Atomic Energy Commission,* AECD-1957, May 12, 1948, 4 pages.

Details of method.

10A-37. The Estimation of Cobalt in Bright Nickel Plating Solutions. H. D. Carter. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 27-31. (Preprint.)

The method of Dickens and Massen is said to be both accurate and rapid.

10A-38. The Determination of Radioactive and Stable Tracer Isotopes. *Analyst,* v. 73, Dec. 1948, p. 644-662.

"The Measurement of Beta-Activity," A. G. Maddock; "The Measurement of Radio-Isotopes," F. E. Whitmore; "The Measurement of Abundance Ratios of Non-Radioactive Isotopes," E. R. S. Winter; "The Measurement of Stable Isotope Abundance Ratios," Eric R. Roberts; and "Tracers in Biochemical Investigations," W. J. Arrol. 66 ref.

10A-39. Gravimétrie automatique en chimie minérale. (Automatic Gravimetric Analysis and Its Application to Mineral Chemistry.) Clément Duval. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 432-440.

The Chevenard thermobalance, which records photographically as a function of time and, if desired, of temperature, the gain or loss of weight of a substance. Typical examples of use in inorganic gravimetric analysis. 23 ref.

10A-40. Statistical Aspects of Chemical Analysis. (In English.) Eric C. Wood. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 441-450; discussion, p. 450-451.

Fundamental principles; methods of sampling; use of "quality control" charts in analytical work. A method of obtaining maximum information from analytical investigations involving estimation of a ratio. 24 ref.

10A-41. Standardization of Analytical Procedures. (In English.) H. A. J. Pieters and R. Schmidt. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 465-474; discussion, p. 475.

The present situation in the field of standardization and the development of an organization for standardization of analytical procedures. Rules for unification in the description of procedure; necessity for standardizing chemical glassware and commonly used apparatus.

10A-42. Standardization and Codification of Analytical Methods. (In English.) R. J. Forbes. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 476-479.

Need for the above.

10A-43. Isotopes as Tracers in Analytical Chemistry. (In English.) A. H. W. Aten, Jr. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 492-500; discussion, p. 500.

Availability of radioactive and of concentrated heavy isotopes in Holland and instruments for their measurement. Principles of the application of tracers in analytical chemistry and examples of the different kinds. Determination of elements by induced radioactivity and by neutron absorption. 38 ref.

10A-44. Modern Trends of Polarographic Analysis. (In English.) J. Heyrovsky. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 533-541.

A review. 30 ref.

10A-45. Controlled Potential Electroanalysis. (In English.) James J. Lingane. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 584-600; discussion, p. 601.

Fundamental principles. A potentiostat which automatically main-

tains the potential of a working electrode constant during an electrolysis. Cells for different applications. Typical applications include electrogravimetric determinations of metals, electrolytic separation of metals with mercury and platinum cathodes prior to polarographic analysis, coulometric analysis, identification of oxidation states that correspond to polarographic waves, and electrolytic preparation of organic and inorganic compounds. 16 ref.

10A-46. Amperometric Titrations. (In English.) I. M. Kolthoff. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 606-621; discussion, p. 621.

The most important literature and applications of amperometric titrations since 1941. Recommends more widespread application. 39 ref.

10A-47. Les méthodes par absorption en chimie analytique. (Absorption Methods in Analytical Chemistry.) G. Duyckaerts. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 649-663; discussion, p. 663.

Development of colorimetric absorptiometric methods over the past 25 years.

10A-48. Colorimetric and Photometric Absorption Analysis. (In English.) D. J. Coumou. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 693-703; discussion, p. 704.

A survey of methods and apparatus. 20 ref.

10A-49. The Polarographic Method for Determining Trace Elements in Rocks and Minerals. Esther W. Claffy. *American Journal of Science,* v. 247, Mar. 1949, p. 187-199.

Describes method particularly suited for quantitative analysis of amounts in the range of 10^{-2}M. to 10^{-9}M., for many metals and nonmetals occurring in rock and minerals.

10A-50. Effect of Alumina on Open-Hearth Roof Life. H. M. Graul and E. B. Snyder. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 135-142; discussion, p. 151-156.

Method for determining alumina which is simple and reliable. Plus error of 0.02% can be expected. Results of service tests. 11 ref.

10A-51. Spectrographic Analysis of Alumina in Silica Brick. P. R. Irish. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 143-151; discussion, p. 151-156.

Fusion furnace used in preparing sample. Results of routine analysis. Accuracy and precision.

10A-52. Versuche zur elektrolytisch-potentiometrischen Analyse. (Experiments on the Electrolytic-Potentiometric Method of Analysis.) Willy Oelsen and Peter Göbbels. *Stahl und Eisen,* v. 69, Jan. 20, 1949, p. 33-38; discussion, p. 38-40.

This method for analyzing metals dispenses with standard solutions. Instead, the kinds and quantities of elements are directly determined by application of Faraday's law of electrolysis. This method is especially well adapted to microanalysis. Two types of equipment. 10 ref.

10A-53. Notes on the Quantitative Determination of Tungsten. (In Russian.) S. I. Gusev and V. I. Kumov. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Nov.-Dec. 1948, p. 373-376.

Possibility of solution of ferrotungsten in oxalic acid and 30% H_2O_2, thus eliminating the necessity for treatment with HF. 20 ref.

10A-54. The Direct Spectrochemical Analysis of Solutions Using Spark Excitation and the Porous Cup Electrode. Cyrus Feldman. *U. S. Atomic Energy Commission,* AECD-2392, Feb. 1, 1948, 10 pages.

Table gives approximate detection limits for various elements as compared with other continuous-feed methods.

10A-55. Sur les mangani- et nickélimolybdates. (Concerning the Manganese and the Nickel Molybdates.) R. Schaal and P. Souchay. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 1-14.

Properties and analytical applications, including determination of Mn, Mo, NH_4, Ag, and Ba. 12 ref.

10A-56. Analytische Auswertung von Reaktionen mit Geschmolzenem 8-Oxychinolin. (Analytical Applications of Reactions With Melted 8-Oxyquinoline.) F. Feigl and L. Baumfeld. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 15-20.

Metal compounds (hydroxides, oxides, and salts of inorganic and organic acids) react with fused hydroxyquinoline to form inner-complex oxinates. The fusion reactions make possible sensitive tests for Fe_2O_3 and V_2O_5 in the presence of greater quantities of other basic or acidic metal oxides.

10A-57. Die Jodometrische Bestimmung von Eisen und Kupfer. (The Iodometric Determination of Iron and Copper.) F. L. Hahn. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 65-68.

Modified procedure for which con-

siderable economy of time and increased precision are claimed.

10A-58. Optical and Electrical Alterations to a Michigan Microphotometer. H. H. Grossman, E. W. Peterson, J. L. Saunderson, and V. J. Caldecourt. *Journal of the Optical Society of America,* v. 39, Mar. 1949, p. 261-263.

A microphotometer of the type described by Vincent and Sawyer was altered to eliminate certain objectionable features. It is being used principally for magnesium alloy analysis in the authors' laboratory.

10A-59. Electrocapillary Curve of Mercury in the Presence of Polyvalent Cations. (In Russian.) L. M. Shtifman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Dec. 21, 1948, p. 709-712.

Data on behavior of the dropping mercury electrode in $AlCl_3$ and $ThCl_4$ and in mixtures of monovalent metal chlorides with them.

10A-60. Note sur l'or dans les minerais de fer. Précautions a prendre pour en déceler la présence. (Note Concerning Gold in Iron Minerals. Precautions Necessary to Detect Its Presence.) A. Riester. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 36-38.

Qualitative procedures. Gold and silver have both been found in economic amounts in various iron ores from the French colonies in Africa.

10A-61. Micro Analysis of Gases Evolved From Metals. Gerald W. Keilholtz and Martha J. Bergin. *Instruments,* v. 22, Apr. 1949, p. 320-321, 360-361.

Apparatus and procedure.

10A-62. Multipurpose Electroanalytical Servo Instrument. James J. Lingane. *Analytical Chemistry,* v. 21, Apr. 1949, p. 497-499.

Instrument provides a variety of automatic services in the electroanalytical laboratory. Its chief components are commercially available units. Various applications, including methods based on electrolysis at controlled potential, constant total applied e.m.f., or constant current, and automatic potentiometric titrations.

10A-63. A Guide to Colorimetric Methods of Analysis. Louis Silverman. *Iron Age,* v. 163, Apr. 28, 1948, p. 88-90, 138, 140, 142, 144, 146, 148, 150-153, 169.

Practical colorimetric methods for the metallurgical analytical laboratory. Tabulates the elements in the various ferrous and nonferrous alloys which can be determined colorimetrically. Those which are best determined colorimetrically, taking into consideration time involved and other factors.

10A-64. A Spectrophotometric Method for the Determination of Aluminum in the Presence of Iron Using Ferron. W. H. Davenport, Jr. *U. S. Atomic Energy Commission,* AECD-2220, July 6, 1948, 5 pages.

Method is suitable for accurate determination of 0-50 μg of Al in the presence of 0-100 μg of Fe.

10A-65. A Review of Infra-Red Spectroscopy in Analytical Chemistry. (In English.) F. R. Cropper and A. Hamer. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 169-179.

154 references.

10A-66. Der Niederspannungsfunken als Lichtquelle der Quantitativen Spektralanalyse. (The Low-Voltage Arc as a Light Source for Quantitative Spectral Analysis.) J. Mika, F. Macher, and B. Vorsatz. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 228-251.

With the help of mobile and rotating mirrors and spectrophotography, a systematic study was made of the various factors which influence the nature of discharge of this type of arc. It is shown that even without a mechanical interrupter, it it possible to use not only d.c. but also a.c. if, in the case of high-frequency current, a suitable device is used. Typical results.

10A-67. Dosages polarographiques du cobalt et du fer a l'aide de nouvelles solutions de base au Trilon. (Polarographic Determination of Cobalt and Iron With Aid of a New Solution Based on "Trilon".) P. Souchay and J. Faucherre. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 252-261.

Trilon B strongly displaces the reduction potentials of numerous elements. Owing to its ready transformation to the trivalent state cobalt can be determined without preliminary separation, in presence of an excess of most other metals. The method is applied to the analysis of steels. After complex formation with Trilon B, small amounts of Fe can also be determined in the presence of an excess of other metals. The method was applied to the determination of small amounts of Fe in brasses and "pure" metals.

10A-68. Sampling and Its Uncertainties. S. S. Wilks. *American Society for Testing Materials, Proceedings,* v. 18, 1948, p. 859-875; discussion, p. 876.

Mathematical and statistical methods for analyzing sampling results. Precision and accuracy of measurements. 12 ref.

10A-69. Improved Spectrographic Power Source Now Practical for Standard Metallurgical Laboratories. W. O. Everling. *Steel,* v. 124, May 16, 1949, p. 80-81, 116.

Under test for the last two years, new equipment provides energy for either the spark or arc method of quantitative analysis, meeting requirements of reproducibility, stability, and ease of operation.

10A-70. Use of Ion Exchangers in Analytical Chemistry. R. H. Lafferty, Jr. *U. S. Atomic Energy Commission,* AECD-2414, Nov. 19, 1948, 11 pages.

A review. 56 ref.

10A-71. Recent Developments in the Technique of Infra-Red Spectroscopy With Some Applications to Scientific and Industrial Problems. G. B. B. M. Sutherland. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 5-16.

52 references.

10A-72. Photoelectric Intensity Measurements in Spectra. C. H. Dieke. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 17-37.

Advantages and disadvantages as compared with photographic methods, giving details of construction and operation of equipment for photo-electric work. 27 ref.

10A-73. On the Use of Spectrochemical Analysis in the Boliden Mining Company. A. Danielsson. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 51-55.

Use by Swedish company.

10A-74. Ultramicroanalysis by X-Ray Absorption Spectrography. A. Engström. *Transactions, Instruments and Measurements Conference* (Stockholm,) 1947, p. 71-75.

Apparatus, technique, and applications. 12 ref.

10A-75. Adaptation of Secondary X-Ray Analysis for Industrial Purposes. A. Kochanovska. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 76-78.

Method and applications.

10A-76. Chemical Analysis by Secondary X-Ray Images. L. von Hamos. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 79-80.

Method of secondary X-ray analysis, where curved crystals have been successfully employed.

10A-77. Uber die Röntgenabsorptionsanalyse und ihre Anwendungsmöglichkeiten in der Technik. (Concerning X-Ray Absorption Analysis and Its Technical Application Possibilities.) E. Laurila. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 81-85.

Fundamental principles, apparatus, and present and potential applications.

10A-78. Recent Applications of Controlled Potential Electrolysis. James J. Lingane. "Electrode Processes" *(Discussions of the Faraday Society,* no. 1, 1947), p. 203-212; discussion, p. 223-225.

A relatively simple potentiostat for automatically maintaining the potential of a working electrode constant during electrolysis. Several recent applications, including separation of metals prior to polarographic analysis, electrolytic preparation of organic compounds, coulometric analysis, and determination of oxidation states that correspond to polarographic waves observed in complicated reactions at the dropping-mercury electrode. 16 ref.

10A-79. Spektrographische Analysenmethoden im Bereich des Erzbergbaues und Metallhuttenwesens. (Spectrographic Methods of Analysis Used in Mining and Metallurgy.) Leutwein. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 75-82.

A general but detailed study of methods of analysis of minerals, mine samples, dressed ores, concentrates, pig metals, and scrap. Apparatus and techniques. 12 ref.

10A-80. Uber die Verwendung des Wechselstrom-Kohlebogens zur quantitativen Spektralanalyse. (Application of the Alternating-Current Carbon Arc for Quantitative Spectral Analysis.) F. Rost. *Zeitschrift fur Angewandte Physik,* v. 1, July 1948, p. 136-139.

Simple processes for determining Al, Ca, Fe, Mg, and Ti in quartz sand; Al, Ca, Fe, Mg, Si, and Ti in coal-tar pitch; and Mo in elementary boron. The a.c. arc differs from the d.c. arc in its small size (3 mm. maximum) and reduced sensitivity to traces. 21 ref.

10A-81. Factors Affecting Accuracy in Spectrographic Analysis. (In English.) Maurice Milbourn. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 267-277.

Factors and possibilities of improving accuracy, 19 ref.

10A-82. Die systematischen Fehler bei der photographischphotometrischen Auswertung von Spektralaufnahmen. (Systematic Errors in the Photographic-Photometric Evaluation of Spectral Patterns.) H. Kaiser. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 278-296.

A generalized scheme for the evaluation of spectra, and application of the theory of density transformations, which lead to a general equation for systematic errors in the evaluation of density measurements in spectrophotometry.

10A-83. Der Einfluss des Untergrunds auf die Gestalt spektrochemischer Eichkurven. (The Influence of Background on the Form of Spectrochemical Calibration Curves.) H. Kaiser. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 297-319.

Theory and equations for the above. For systematic errors of analysis which arise through use of a substituted straight line, a simple formula is given. From this a graph is derived for determining whether or not a background correction is necessary in a given case. Theory is illustrated by an experimental example (determination of Mn in Al).

10A-84. Quantitative Spectrographic Analysis by Spark Excitation of Metallic Oxides. (In English.) Maurice Milbourn and H. E. R. Hartley. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 320-326.

New technique for analyzing a finely ground powder, such as a mixture of metallic oxides, which is placed in a crater in the lower electrode of a spark discharge. The powder is ejected continuously into the vapor column, and a source combining good sensitivity and reproducibility is obtained. This technique has been used successfully for many metallurgical analyses, especially those which are not of a routine nature.

10A-85. Some Improvements in the Technique of Spectrographic Analysis of High Purity Materials. (In English.) D. M. Smith and G. M. Wiggins. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 327-340.

Various aspects, using the intermittent a.c. arc and the constant current d.c. arc as excitation sources. High-purity graphite electrodes are generally used for analysis of metals and compounds, although the carbon arc in steam is used for analysis of rare-earth oxides for other rare-earth elements present as impurities. A method for the complete qualitative analysis of volatile elements and compounds.

10A-86. Une méthode d'analyse spectrale applicable a de faibles traces d'impuretés dans les métaux. (A Method of Spectrographic Analysis Applicable to Minute Traces of Impurities in Metals.) J. Orsag. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 341-345.

For estimating volatile impurities it has been found practicable to make use of three alloys near the lower limit of chemical analysis for a complete calibration line. Results of application to Na in Al. As little as 0.0005% Na was estimated.

10A-87. Estimation of Coal Dust in Foundry Sand. A. McD. McConnell and J. McPheat. *Foundry Trade Journal,* v. 86, May 19, 1949, p. 465-469.

Previously described methods and new combustion-train method, said to be superior. Typical results.

10A-88. Principles and Limits of Accuracy in Polarographic Analysis. Paul H. Sherrick. *Canadian Chemistry and Process Industries,* v. 33, May 1949, p. 415-420, 423-424.

10A-89. Determination of Nonmetallic Inclusions in Samples of Metal Obtained at Different Stages of Melting. (In Russian.) A. M. Danilov and E. D. Mokhir. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 358-362.

Technique of sampling and determination. Typical results.

10A-90. Rapid Determination of Calcium in Sinter Cakes. (In Russian.) Yu. I. Usatenko and P. A. Bulakhova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 362-363.

Procedure and reagents used. Time of determination is ½ hour, said to be several times less than for commonly used methods.

10A-91. Phosphattitration weiterer Schwermetall-Ionen. (Phosphate Titration of Additional Heavy-Metal Ions.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 129, no. 1, 1949, p. 43-61.

Details of methods applicable to Fe, Ni, Cu, Sn, Bi, Hg, and Ti ions.

10A-92. (Book) **Recent Advances in Analytical Chemistry.** R. E. Burk and Oliver Grummitt, editors. 209 pages. 1949. Interscience Publishers, 215 Fourth Ave., New York, N. Y. (Frontiers in Chemistry, v. 7.)

"Voltammetry (Polarography) and Amperometric Titrations", I. M. Kolthoff; "Inorganic Analysis With Organic Reagents", John H. Yoe; "Some Recent Colorimetric and Gravimetric Organic Reagents", John H. Yoe; "Application of Infrared Spectroscopy in Analysis", Otto Beeck; "Electron Microscopy and Microanalysis — New Methods in

Chemistry", James Hillier; "Fractionation, Analysis, and Purification of Hydrocarbons", Frederick D. Rossini; and "Applications of the Mass Spectrometer", J. A. Hipple. 150 ref.

10A-93. The Influence of Extraneous Elements on Line Intensity. IV. Extraneous Element Effects in the Direct-Current Arc. Wallace R. Brode and Donald L. Timma. *Journal of the Optical Society of America,* v. 39, June 1949, p. 478-481.

Effect of varying amounts of extraneous element upon the line intensity of different elements. Slavin's total-energy method was used to make possible a more direct correlation than has been achieved using the internal-standard method. Effect of the extraneous element varies with amount, but not in a simple linear fashion. The elements can be arranged in a series based on their interelement effects in the d.c. arc. Arrangement in a series based on boiling points and excitation potentials is in agreement with experiment.

10A-94. Emulsion Calibration Scale for Quantitative Spectroscopic Analysis. Harold K. Hughes and R. W. Murphy. *Journal of the Optical Society of America,* v. 39, June 1949, p. 501-504.

Time devoted to collecting and plotting emulsion-calibration data can be reduced considerably by use of a new transmittance scale which is logarithmic from 1 to 30% and which then expands nonuniformly to 97%. Data from seven independent laboratories which establish the approximate linearity of the emulsion-calibration curves for several commercial films and plates. Practical uses.

10A-95. Uber die rhodancolorimetrische Bestimmung kleiner Eisenmengen. (The Thiocyanate Colorimetric Method for Determining Small Quantities of Iron.) Willy Hacker, Agnes Zimmermann, and Heinz Rechmann. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 129, no. 2, 1949, p. 104-124.

Experiments which show that the ferro-thiocyanate reaction is an accurate and rapid method for determining small iron contents, and is unaffected by the presence of other metals. 10 ref.

10A-96. Bericht uber die Fortschritte der analytischen Chemie. I. Allgemeine analytische Methoden, analytische Operationen, Apparate und Reagenzien. (Report on the Progress of Analytical Chemistry. I. General Analytical Methods, Analytical Operations, Apparatus and Reagents.) R. Fresenius, A. Kurtenacker, and H. Freytag. **II. Chemische Analyse anorganischer Stoffe.** (Chemical Analysis of Inorganic Substances.) A. Kurtenacker and H. Freytag. **IV. Spezielle analytische Methoden. 2. Auf Handel, Industrie und Landwirtschaft bezugliche Methoden.** (Special Analytical Methods. 2. Methods Applicable to Commerce, Industry, and Agriculture.) W. Grutz and H. Freytag. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 129, no. 2, 1949, p. 165-190, 202-207.

An extensive collection of brief "abstracts", each covering one or more papers dealing with a specific topic. References are mainly from the past decade.

10A-97. Improvement in Precision of Polarographic Analysis. Rolf K. Ladisch and Clifford E. Balmer. *Analytical Chemistry,* v. 21, June 1949, p. 679-683.

Effect of relative humidity upon dimensional changes of photo-recorded polarograms. A method for increasing the precision of wave-height measurements about 25-fold. 14 ref.

10A-98. Determination of Titanium and Iron; Rapid Control Determination of Both in Same Sample. B. A. Shippy. *Analytical Chemistry,* v. 21, June 1949, p. 698-699.

Method employs titration of a reduced solution with standard potassium permanganate. 16 ref.

10A-99. Volatilization of Elements From Perchloric and Hydrofluoric Acid Solutions. Francis W. Chapman, Jr., George G. Marvin, and S. Young Tyree, Jr. *Analytical Chemistry,* v. 21, June 1949, p. 700-701.

Mixed $HClO_4$ and HF solutions containing compounds of 37 elements were evaporated at 200° C. Such mixed solvents are often used during preparation of samples for analysis. Analysis of the residues showed that appreciable quantities of B, Si, Ge, As, Sb, Cr, Se, Mn, and Re are lost during such treatment. No losses of Na, K, Cu, Ag, Au, Be, Mg, Ca, Sr, Ba, Zn, Cd, Hg, La, Ce, Ti, Th, Sn, Pb, V, Bi, Mo, W, U, Fe, Co, or Ni were observed. 16 ref.

10A-100. Silica Refractories; Spectrographic Analysis Using a Controlled Multisource Power Unit. A. J. Herdle and H. J. Wolthorn. *Analytical Chemistry,* v. 21, June 1949, p. 705-707.

Method which utilizes a sample of the pulverized refractory directly for the determination of Ca, Mg, Ti, Al, Fe, Na, and K, and determines Si by difference.

10A-101. Determination of Aluminum in Presence of Iron; Spectrophotometric Method Using Ferron. W. H. Davenport, Jr. *Analytical Chemistry,* v. 21, June 1949, p. 710-711.

Previously abstracted from *U. S. Atomic Energy Commission,* item 10A-64, 1949.

10A-102. Silica Refractories; Spectrographic Analysis Using the Direct Current Arc and High Voltage Spark. Ralph H. Steinberg and Henry J. Belic. *Analytical Chemistry,* v. 21, June 1949, p. 730-731.

Method for alumina, titania, potassium oxide, and sodium oxide. Accuracy is comparable to best chemical methods.

10A-103. A Rapid Automatic Method of Computing Infrared Spectra for Quantitative Analyses. Robert W. Foreman and Warren Jackson, Jr. *Instruments,* v. 22, June 1949, p. 497-499.

Apparatus using a continuous-balance recording potentiometer. Mode of operation, reproducibility, and accuracy.

10A-104. Report of Committee E-3 on Chemical Analysis of Metals. *American Society for Testing Materials,* Preprint 73, 1949, 6 pages.

Includes miscellaneous recommendations for revisions in methods.

10A-105. Etude du systeme SiO_2-Al_2O_3-CaO par analyse quantitative aux rayons X. (Study of the System SiO_2-Al_2O_3-CaO by Quantitative X-Ray Analysis.) Marcel Von Euw. *Comptes Rendus* (France), v. 228, Apr. 4, 1949, p. 1226-1228.

Method for analysis and typical results for a series of slags. The possibility of quantitative analysis of complex compounds of different silicates and calcium aluminates is indicated.

10A-106. Tannin as a Reagent in Qualitative Analysis. (In English.) H. Holness. *Analytica Chimica Acta,* v. 3, May 1949, p. 290-294.

Tannin complexes of Bi and Ce are described for the first time and use of the reagent advocated as a routine test in the qualitative analysis of single substances. Specificity of the test is claimed for several elements. Usual qualitative group separation of tin is criticized and an alternative method offered.

10A-107. Tannin as a Reagent in Quantitative Analysis. (In English.) H. Holness and G. Mattock. *Analytica Chimica Acta,* v. 3, May 1949, p. 320-323.

Small positive errors observed in the determination of various elements were traced to heavy metal impurities by analysis of the ashes of six tannin samples. It was shown that treatment with 0.2 N NH_3, whereby impurities are precipitated, is effective in removing these errors

10A-108. Application of Solid Electrodes in Polarography. Part V. Solid Electrodes With Electrochemical Depolarization. (In Russian.) E. M. Skobets and P. P. Turov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 414-417.

Proposes application of a stationary electrode, which is renewed by electrochemical depolarization. Experimental investigation indicates attractive possibilities for use of such electrodes in polarographic analysis.

10A-109. (Book) **Tables of Reagents for Inorganic Analysis; Third Report of the "International Committee on New Analytical Reactions and Reagents" of the "Union internationale de Chimie."** 204 pages. 1948. Academic Press, New York 10, N. Y.

Material is presented in French, English, and German. Describes all new reactions and reagents from 1937 to 1947. Deals with qualitative reactions under the microscope, on the spot-plate, on filter-paper, in the micro and macro test-tube, and in the micro-crucible. Reagents are classified according to types, and arranged according to precipitation reactions, color and catalytic reactions, and those which do not belong to any other group.

10A-110. (Book.) **Reagents for Qualitative Inorganic Analysis.** 2nd report. P. E. Wenger and R. Duckert, editors; C. J. Van Nieuwenburg and J. Gillis, authors. 379 pages. 1948. Elsevier Publishing Co., 215 Fourth Ave., New York 3.

Tables of all reagents employed in the determination of cations and anions. Second Report covers reagents introduced into analytical practice between 1937 and 1943. Material is subdivided according to type of reaction. Details of procedure, sensitivity, and interference are included. 1172 ref.

10A-111. Automatic Recording of Polarographic Data. L. B. Rogers and others. *Analytical Chemistry,* v. 21, July 1949, p. 777-781.

Polarographic analyses appear to be feasible using a platinum micro-electrode and the usual automatic recording technique. The effects on half-wave potential and diffusion current of using different

rates of polarization, larger electrode areas, and stirring. 15 ref.

10A-112. Problemes d'analyse polarographique moderne. (Problems of Modern Polarographic Analysis.) P. Souchay. *Bulletin de la Société Chimique de France*, Mar.-Apr. 1949, p. D97-D107.

Survey. 57 ref.

10A-113. Luminescent Analysis of Minerals. (In Russian.) G. F. Komovskii. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya* (Bulletin of the Academy of Sciences of the USSR, Physical Series), v. 13, Mar.-Apr. 1949, p. 248-249; discussion, p. 249-250.

Simple apparatus based on the principle of cathode luminescence. Applications in mineralogy, particularly in minerals containing rare-earth elements.

10A-114. Potentiometric Method for Determination of Aluminum in Bronzes and Steel. (In Russian.) B. G. Ivanov and S. M. Bezyaiko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 511-514.

Possibility in the presence of the basic elements in Al-Fe, Al-Fe-Mn and Al-Fe-Ni; and a potentiometric method for direct determination of Al in these bronzes and a steel.

10A-115. Spectrographic Analysis; Use of the General-Purpose Source Unit for Non-Ferrous Alloys. P. T. Beale. *Metal Industry,* v. 75, July 15, 1949, p. 43-45, 49.

Methods in use at the British Non-Ferrous Metals Research Assoc. for analysis of miscellaneous metal samples.

10A-116. (Book) **Analyse der Metalle.** (Analysis of Metals.) O. Proske and H. Blumenthal. Vol. I, ed. 2. 508 pages. 1949. Springer Verlag, Berlin, Germany. 32 Rm.

First in a series of manuals, edited by the Chemical Division of the Society of German Metallurgists and Miners. It represents the joint work of 60 experts in analytical methods. The elements are dealt with in alphabetical order by chapters, describing not only the principles of analysis, but also their application to raw materials and finished products.

10A-117. Electrographic Analysis For Identifying High-Temperature Alloys. Marvin E. Levy. *Iron Age,* v. 164, Aug. 18, 1949, p. 98-100.

Rapid detection of Cr, Ni, Co, Mo, W, Ti, and Fe in high-temperature alloys is made possible by spot tests applied to electrographic analysis. The technique. Specific instructions for detection of the above elements in 11 alloys.

10A-118. Spectrophotometric Determination of Cobalt as Cobalt (II) Chloride in Ethanol; Determination of Water in Ethanol. Gilbert H. Ayres and Betty Vining Glanville. *Analytical Chemistry,* v. 21, Aug. 1949, p. 930-934.

Optimum range for measurement with the instrument and procedure used is 100-400 p.p.m. of Co, with an accuracy of 0.5%. The effect of diverse ions was studied. The method was tested by comparison with other methods in the assay of a cobalt salt and in the analysis of a standard steel. Water modified the color of the cobalt chloride-ethanol solutions; this effect is the basis for a method for estimating water in ethanol.

10A-119. 5, 6-Dimethyl-1, 10-Phenanthroline; Spectrophotometric Constants as Ferrous Complex and Use as Redox Indicator for Determination of Iron by Oxidation With Dichromate. G. Frederick Smith and Warren W. Brandt. *Analytical Chemistry,* v. 21, Aug. 1949, p. 948-950.

10A-120. Determination of High Percentages of Copper With a Beckman Spectrophotometer. Robert Bastian. *Analytical Chemistry,* v. 21, Aug. 1949, p. 972-974.

Method has a precision of 1-3 parts per thousand. It utilizes the color of the cupric ion contained in 10% perchloric acid solution. The commonly occurring colored metal ions, Co, Fe, Cr, and N, in concentrations up to 4% each, do not interfere. The method has been applied to a lead brass, a phosphor bronze, and a synthetic sample.

10A-121. Determination of Hydrogen; Universal Gasometric Micromethod. Leonard P. Pepkowitz and Everett R. Proud. *Analytical Chemistry,* v. 21, Aug. 1949, p. 1000-1003.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2365. See item 10C-42, 1949.

10A-122. Fortschritte der spektrochemischen Lokalanalyse. (Advances in Spectrochemical "Spot" Analysis.) Paul Klinger and Otto Schliessmann. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 219-228.

New methods for determining inhomogeneities in metallic matrices. 14 ref.

10A-123. Microsampling and Microanalysis of Metals. Donald F. Clifton and Cyril Stanley Smith. *Review of Scientific Instruments,* v. 20, Aug. 1949, p. 583-586.

Design and use of a microshaper using a diamond tool to take linear cuts separated by as little as 0.02 mm. A hand-driven drill can be used

for sampling circular areas of diameter greater than 0.1 mm. The chips, which may weigh as little as 0.1 microgram, are picked up on an electrified quartz fiber and centrifuged into a capillary which is evacuated and sealed for annealing. A precision X-ray diffraction photograph is then obtained from the annealed chip and the calculated lattice parameter used as an index of composition.

10A-124. Industrial Spectroscopy; A Review of Modern Methods and Equipment. D. M. Smith. *Metal Industry,* v. 75, Aug. 19, 1949, p. 149-150.

10A-125. Semimicrochemical Method for Analysis of Blast-Furnace Slag. (In Russian.) E. Ya. Shmulevich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 742-743.

Modified method, characterized by use of 0.2 g. samples, and in the case of determination of MnO_2, of 0.02 g.; and by substitution for potassium chlorate of ammonium persulfate in ammoniacal medium for oxidation of Mn.

10A-126. Spectral Analysis of Metallic Coatings. (In Russian.) K. I. Taganov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 695-700.

Describes simple method for the above and for spectroscopic determination of coating thicknesses.

10A-127. Spektrochemische Analyse von Verunreinigungen an Metallen und Lösungen unter besonderer Berücksichtigung der in galvanischen Betrieben erforderlichen Untersuchungen. (Spectrochemical Analysis of Impurities in Metals and Solutions, With Special Reference to Tests Required in Metal-Plating Plants.) H. Moritz. *Metalloberflache,* v. 2, Nov. 1948, p. 237-245; Dec. 1948, p. 262-268.

Principles of spectrochemical analysis. Design and operation of the instruments required. Analytical methods are demonstrated by several specific examples. 23 ref.

10A-128. (Book) Chemistry of Specific, Selective and Sensitive Reactions. Fritz Feigl. 740 pages. 1949. Academic Press, 125 East 234th St., New York, N. Y. (Translated by Ralph E. Oesper.)

The mechanism of chemical reactions, the composition and constitution of reacting substances, and the products obtained, as well as the influence of reaction conditions. Relationship between solubility, color, fluorescence, etc., and constitution of compounds. 2184 ref.

10A-129. (Book) R. T. B. Methods of Analysis. 112 pages. Richard Thomas & Baldwins, Ltd., 47 Park St., London, W.1, England.

Part I covers ferrous; Part II nonferrous metals; Part III deals with raw materials, such as ores, fluxes, refractories and slags; Part IV includes miscellaneous analysis such as water, pickle solutions, and tin coatings; Part V consists of tables.

10A-130. Determination of Oxygen in Metals by the Vacuum Fusion Method. R. K. McGeary, J. K. Stanley, and T. D. Yensen. *American Society for Metals,* Preprint No. 10, 1949, 16 pages.

An improved type of vacuum-fusion apparatus for determination of total oxygen in metals, and its operation. The apparatus is capable of analyzing samples weighing 0.1-2 g. and the operator can run samples in 15-20 min. each with an accuracy of about $\pm 0.001\%$. 14 ref.

10A-131. Quantitative Inorganic Paper Chromatography. Sub-Micro Separation and Determination of Aluminium, Iron and Titanium. A. Lacourt, G. Sommereyns, E. Degeyndt, J. Barugh and J. Gillard. *Metallurgia,* v. 40, July 1949, p. 181-182.

10A-132. Gas Evolution From Weld Metal Deposits. I. L. Stern, J. Kalinsky, and E. A. Fenton. *Welding Journal,* v. 28, Sept. 1949, p. 405s-413s.

Importance of measuring rates and quantities of hydrogen evolved and improved methods for determination. 19 ref.

10A-133. Direct Spectrochemical Analysis of Solutions Using Spark Excitation and the Porous Cup Electrode. Cyrus Feldman. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1041-1046.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2392. See item 10A-54, 1949.

10A-134. Determination of Cottonseed Oil on Tin Plate. J. G. Donelson and R. A. Neish. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1102-1104.

The majority of tin plate produced by the continuous electrotinning process is lubricated with edible grade cottonseed oil in order to inhibit oxidation of the plate during storage and to provide some degree of lubrication for subsequent forming operations. Improved technique for its determination.

10A-135. Direct Determination of Chromate Ion With Standard Arsenite and Diphenylamine as Indicator. Zoltan Szabo and Ladislaus Csanyi. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1144-1145.

Use of the above for determination of Cr in steel.

10A-136. Rapid Analysis. Walter Bonsack. *Metal Progress,* v. 56, Oct. 1949, p. 488-489.

Operation results of the Quantometer. It has speeded composition determination with increased accuracy at the Apex Smelting Co.

10A-137. Automatic Recording of Titrations. J. M. Gonzalez Barredo and John Keenan Taylor. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 437-444.

Previously abstracted from Preprint 92-26. See item 10-227, 1947.

10A-138. Automatic Potentiometric Titrations. H. A. Robinson. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 445-464; discussion, p. 464.

Application of the potentiometric method to both analytical and general research work. Automatic apparatus developments, and an instrument capable of automatically performing and plotting potentiometric titrations, and adaptable to a variety of electrode systems. Construction and operating principles as well as calibration, method of use, and performance characteristics.

10A-139. The Absorptiometric Determination of Traces of Metals. Reversion: A New Procedure. Harry Irving, E. J. Risdon, and Geoffrey Andrew. *Journal of the Chemical Society,* Mar. 1949, p. 537-541.

Factors influencing accuracy with which metals can be determined absorptiometrically after extraction by an immiscible organic phase as complexes. Existing procedures are shown to fail when adventitious light-absorbing materials derived from the analytical sample are absent in the control determination. New procedure in which a single calibration curve serves for determination of a number of metals with dithizone.

10A-140. Spectrochemical Analysis; Technique for Determining Composition From Alloy Solutions. G. S. Smith. *Metal Industry,* v. 75, Sept. 30, 1949, p. 267-268.

Special apparatus and solution technique recently described by Russian investigators. The apparatus, which is known as a "fulgurator" permits direct determination of the composition of alloy solutions at a rate of 30 per hr. Similar apparatus used for determination of trace elements.

10A-141. Die photometrische Bestimmung des Molybdäns mittels Thioglykolsäure. (Photometric Determination of Molybdenum by Means of Thioglycolic Acid.) Fritz Richter. *Chemische Technik,* v. 1, July 1949, p. 31-34.

Method, including example of application to Mo in steel.

10A-142. The Analytical Uses of Dithiocarbamido-Hydrazine. J. Gupta and B. Chakrabartty. *Journal of Scientific & Industrial Research,* v. 8B, Aug. 1949, p. 133-137.

Use in qualitative and quantitative determination of a number of common metallic cations.

10A-143. The Use of Surface Active Agents to Prevent "Precipitate Crawling" and to Speed Filtration in Gravimetric Determinations. (In English.) J. N. Ospenson. *Acta Chemica Scandinavica,* v. 3, no. 6, 1949, p. 630-638.

Certain surface-active agents are capable of preventing "crawling", thus speeding filtration, and maintaining accuracy in the determination of Ni as Ni-dimethylglyoxime. The agents are classified according to the types given by McCutcheon.

10A-144. Reversible Indicators for Use in Potassium Bromate Titrations. (In English.) R. Belcher. *Analytica Chimica Acta,* v. 3, Sept. 1949, p. 578-588.

The reversible indicators α-naphthoflavone, p-ethoxychrysoidine, fuchsin, and apomorphine are satisfactory, but α-naphthoflavone gives the sharpest end-points. Titration of trivalent antimony and determination of aluminum. 11 ref.

10A-145. Laboratories That Make Fire Assays, Analyses, and Tests on Ores, Minerals, Metals, and Other Inorganic Substances. Bertha R. Klahold. *U. S. Bureau of Mines,* Information Circular 7523, Oct. 1949, 55 pages.

Various testing techniques. Data on laboratories, their addresses, and special services.

10A-146. Increase of Stability of the Activated Alternating-Current Arc Under Spark Conditions for Spectro-Analytical Purposes. (In Russian.) I. S. Abramson and O. B. Fal'kova. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, May 1949, p. 611-615.

Three circuits for improving stability.

10A-147. Rapid Method for Determination of Calcium Carbide in Slag. (In Russian.) A. G. Bogdanchenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 851-853.

Method based on solution of slag in dilute acid and combustion of the liberated acetylene. Four variations of the apparatus. Typical data.

10A-148. Apparatus for Selection of Samples of Metals for Microchemical Analysis. (In Russian.) E. S. Berkovich and A. D. Kuritsyna. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 868-869.

Applicable for qualitative and, possibly, quantitative determination of chemical nature of phases, especially

inclusions, in an alloy. Apparatus for obtaining microsamples is a modified microhardness-testing device, having a special spindle with a diamond drill on the bottom. Method of obtaining sample.

10A-149. Investigation of the Effect of Spark Formation and Influence of Third Elements During Spectral Analysis. Part I. (In Russian.) L. N. Filimonov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 919-936.

Investigated for different alloys in oxidizing and reducing atmospheres. Effect of different factors; technique of investigation. 25 ref.

10A-150. Spectroscopic Method for Determination of Silicon and Chromium in Certain Ferro-Alloys. (In Russian.) P. D. Korzh and A. V. Kozlova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 937-939.

Method using comparison of densities in unknown and standard specimens. Results of typical determinations.

10A-151. Spectroscopic Analysis of Ferrosilicon. (In Russian.) I. M. Veselovskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 940-944.

Use of briquettes. Method of briquette preparation and influence of various factors on results of analysis.

10A-152. Determination of Tungsten in Ferrotungsten High-Speed Toolsteels on the Basis of Specific Gravity. (In Russian.) S. I. Malov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 997-998.

Method is said to surpass the chemical method in accuracy.

10A-153. Beryllium; Determination in Presence of Much Fe, Al and Mg. A. Leibowitz and R. S. Young. *Iron and Steel*, v. 22, Nov. 1940, p. 486.

Gravimetric procedure.

10A-154. The Role of Organic Reagents in the Chemistry of Specific, Selective, and Sensitive Reactions. Fritz Feigl. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1298-1313.

Correlated review of the literature. 108 ref.

10A-155. Polysubstituted 1,10-Phenanthrolines and Bipyridines as Multiple Range Redox Indicators; Further Applications as Specific Organic Analytical Reagents. Warren W. Brandt and G. Frederick Smith. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1313-1319.

Use in the photometric determination of Fe, Cu, Mo, and Co, and detection of other metals; and as masking reagents.

10A-156. Organic Reagents in Inorganic Analysis; Sources of Error and Interferences. Philip W. West. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1342-1344.

A general survey. 10 ref.

10A-157. Photometric Determination of Sulfur in Metals and Alloys. C. L. Luke. *Analytical Chemistry*, v. 21, Nov. 1949, p. 1369-1373.

Procedure consists of solution of the sample in a mixture of HCl and HNO_3, destruction of the HNO_3, reduction of sulfate to sulfide with the aid of HI, distillation of H_2S into a solution of NH_4OH, and finally precipitation as colloidal PbS, and measurement of transmittancy of the sulfide sol at 370 mμ.

10A-158. Recording Device Streamlines Analyzing of Molten Metal. *American Foundryman*, v. 16, Dec. 1949, p. 57.

Rapid spectrographic technique.

10A-159. (Book) **Methods of Quantitative Micro-Analysis.** R. F. Milton and W. A. Waters, Editors. 599 pages. 1949. Edward Arnold & Co., London.

Gravimetric apparatus; general microchemical techniques; microanalysis of organic compounds; volumetric and colorimetric analysis; and electrochemical and gasometric methods. Footnote references.

10B—Ferrous

10B-1. Analysis of Steel Speeded by Improved Combustion Technique. *Industrial Heating*, v. 15, Dec. 1948, p. 2116, 2118.

Method developed by H. J. Wolthorn of Carnegie-Illinois Steel Corp. is carried out at a temperature of 1100° C., about 60° higher than the former combustion procedure. Three electrically heated furnaces, using nonmetallic resistor heating elements, are each equipped with two silica tubes, so that six samples can be analyzed at the same time. Simplified preparation of samples, plus the higher test temperature used, has reduced the time for individual tests from an average of 10 to 8 min.

10B-2. Moly Mold Samples Increase Accuracy of Spectrographic Analysis. Henry A. Tuttle and Ford R. Bryan. *Iron Age*, v. 162, Dec. 23, 1948, p. 57-59.

By casting samples of cast iron and cast steel in a molybdenum insert mold, spectrographic analysis deviations are cut to as little as one-third of the variance experienced with samples from iron molds.

10B-3. Investigation of Method for Analysis of Steel by Partial Solution of the Test Specimen. (In Russian.)

E. P. Terent'eva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1203-1207.

Investigates the applicability of method of Tananaev on an industrial scale. Data obtained in the determination of manganese and nickel showed promising results. Time of determination is between 11 and 13 min. Only part of the sample is dissolved, leaving the remainder for further analysis. Results of a typical determination of Mn and Ni were encouraging.

10B-4. Photocolorimetric Method of Determination of Silicon in Cast Irons and Steels. (In Russian.) E. E. Cheburkova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1261-1262.

A method based on the formation, with molybdic acid, of a heteropoly acid of yellow color which forms molybdenum blue when reduced with tin chloride.

10B-5. Rapid and Accurate Method for Determination of Small Amounts of Carbon in Steels. (In Russian.) B. K. Podkorytov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1262.

Method is claimed to have much greater accuracy than the volumetric "barite" method.

10B-6. Carbon and Sulphur; Combustion Technique in the Laboratory. J. Winning. *Iron and Steel,* v. 21, Dec. 1948, p. 615-617.

Problems involved in routine carbon and sulphur determination in iron and steel by the combustion-tube method. Recommendations for best results and alleviation of difficulties.

10B-7. A Review of Methods of Determining Carbon in Steel. Ralph L. Wilson. *American Iron and Steel Institute,* 1948, 7 pages.

Advantages and limitations of the various methods for routine work.

10B-8. A Method of Identifying Manganese-Sulphide Inclusions in Steel. J. H. Whiteley. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 365-366.

Describes method using a Selvyt cloth which has been soaked in a solution of silver nitrate and well washed. Typical results.

10B-9. First Report of the Gases and Non-Metallics Sub-Committee. Part I. Introduction. W. W. Stevenson. **Part II. The Determination of Oxygen in Liquid Steel by the Aluminum-Killed Bomb Method.** G. E. Speight. **Part III. The Determination of Hydrogen in Liquid Steel.** G. E. Speight and R. M. Cook. **Part IV. A Cooperative Examination of a Manganese-Molybdenum Steel.** T. E. Rooney. **Part V. A Co-operative Examination of a Nickel-Chromium Steel.** T. E. Rooney. **Part VI. A Co-operative Examination of the Distribution of Non-Metallic Inclusions in Billets From a Mild-Steel Ingot.** T. E. Rooney. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 388-415.

Organization and personnel of the subcommittee and abstracts of four papers published under its sponsorship during the past 2½ years. Part II gives results of analysis of bomb samples from acid and basic open-hearth practice to determine reproducibilities of gravimetric, nephelometric, and vacuum-fusion methods for oxygen. Examples of bomb tests from acid heats after deoxidation with ferrosilicon, and from comparable Al-killed and nonkilled samples. Part III describes two sampling methods: the "sealed-mold" and "chilled-pencil" techniques. Results for low-alloy openhearth and electric-furnace steels. Parts IV, V, and VI give results of micrographic and X-ray examinations, and oxygen determinations by vacuum fusion, fractional vacuum fusion, Al reduction, and the chlorine and alcoholic iodine residue method.

10B-10. The Absorptiometric Determination of Manganese in Steel. *Metallurgia,* v. 39, Dec. 1948, p. 105-110.

Committee report gives results of an exhaustive investigation of possible variants of two methods for absorptiometric determination of manganese in steel. Superiority of periodate over catalyzed persulfate oxidation having been confirmed, a tentative standard method is formulated.

10B-11. Determining Small Amounts of Carbon in Steel. *Steel,* v. 124, Jan. 31, 1949, p. 60-61, 74, 78.

Experiments indicate that usual methods give high results. The low-pressure combustion method was found to give precise results for low-carbon steels, even when used on a routine basis.

10B-12. Novy zpusob mikroanalytickeho urceni hliniku v oceli. Upravena metoda oxychinolin-kyanidova. (New Method for Microanalytical Determination of Aluminum in Steel. Modified Oxyquinoline Cyanide Method.) Miroslav Sicha. *Hutnické Listy* (Metallurgical Topics), v. 3, Oct. 1948, p. 293-296.

A new method for microanalytical determination of metallic and total aluminum content in iron and steel is based on the precipitation of Al by an 8% $NaHCO_3$ solution.

10B-13. An investigation of Spectrochemical Sparking-Off Effects in the Flat Surface Sparking of Steels. (In English.) D. M. de Waal and A. Strasheim. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 141-158.

An investigation of the above led to adoption of a short spark gap (1.5 mm.) and a blunt graphite electrode to limit the length of the spark. This improvement did not eliminate the drift of working curves. Analysis of sparking-off effects indicates a large oxidation effect and the role of water vapor in the spark atmosphere. It is suggested that variable atmospheric humidity may be one major cause of curve drift. 11 ref.

10B-14. Determination of Calcium and Magnesium in Iron Ore Using "Cationite". (In Russian.) Yu. I. Usatenko and O. V. Datsenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1323-1327.

A new method using organic electrolytes (organolytes). A newly developed variation of adsorption analysis is incorporated in this method. Experimental investigation confirmed applicability to analysis on an industrial scale.

10B-15. Apparatus for Determination of Carbon. (In Russian.) M. V. Babsev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1392-1394.

Existing methods for carbon determination in ferrous metals. A modified apparatus of simpler construction is said to give data of sufficient accuracy for many purposes.

10B-16. Shop Tests for Identifying Steels. *American Machinist,* v. 93, Feb. 10, 1949, p. 139.

A tabular presentation.

10B-17. Elektrolytische Isolierung der Karbide in legierten und unlegierten Stählen. (Electrolytic Separation of Carbides in Alloyed and Unalloyed Steels.) Walter Koch. *Stahl und Eisen,* v. 69, Jan. 6, 1949, p. 1-8.

The principles, conditions, and limitations of the separation of carbides from steels for analytical purposes by use of acids and electrolytically. 15 ref.

10B-18. Method of Volumetric Determination of Silicon in Cast Irons and Steels. (In Russian.) P. P. Budnikov and S. S. Zhukovskaya. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 21, Sept. 1948, p. 959-961.

A modified volumetric method based on the precipitation of potassium silicon fluoride followed by titration of the precipitate. Data obtained by above method and by the gravimetric method are compared.

10B-19. Ferrous Metallurgy. H. F. Beeghly. *Analytical Chemistry,* v. 21, Feb. 1949, p. 241-246.

Tools, methods, and procedures for determining either the presence or amount of an element or compound in a ferrous matrix. 194 ref.

10B-20. Rapid Tests for Identifying Alloy Steels. Elbert C. Kirkham. *American Machinist,* v. 93, Feb. 24, 1949, p. 93-104.

Spot-test qualitative system and test kit. Some practical applications are cited. 32 ref.

10B-21. Amyl Acetate: A Solvent for the Separation of Iron in Metallurgical Analysis. J. E. Wells and D. P. Hunter. *Analyst,* v. 73, Dec. 1948, p. 671-673.

Method for separation of iron from chloride-sulfate solutions of steel has marked advantages over the more usual ether separations.

10B-22. Influence of the Reagent Concentration on the Colorimetric Copper Determination With Sodium Diethyl Dithiocarbamate (Abbreviated: D D.C.) and Its Importance for the Determination of Copper in the Presence of Large Amounts of Iron. (In English.) P. Karsten, S. C. Rademaker, and J. J. Walraven. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 705-710; discussion, p. 710-711.

10B-23. An Electronic Carbon Analyzer for Steel Samples. A. C. Chamberlin and E. J. Serfass. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 266-278.

Construction, operation and properties of an electronically operated carbon analyzer, designed for direct-reading to 0.01% carbon. 17 ref.

10B-24. Dosage du cuivre, du mercure et de l'arsénic en présence prédominante du fer. (Determination of Copper, of Mercury, and of Arsenic in the Presence of Predominant Amounts of Iron.) M. Jean. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 100-107.

Recommended methods. 14 ref.

10B-25. Unterscheidung unlegierter Stähle durch Funkenprufung. (Identifying Unalloyed Steels by the "Spark Test".) Walter Jäniche and Karl-Hugo Saul. *Stahl und Eisen,* v. 68, Aug. 12, 1948, p. 301-303.

How the spark test can be used to determine the approximate carbon contents.

10B-26. Determination of Iron and Un-

dissolved Residue in Ores Without Use of Mercuric Chloride and Phosphoric Acid. (In Russian.) Yu. I. Usatenko and P. A. Bulakhova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1420-1421.

Proposes the use of phenylanthranilic acid having a much higher oxidation-reduction potential than trivalent iron, thus eliminating the necessity for phosphoric acid.

10B-27. Corrections During Determination of Carbon in Ferrochromium. (In Russian.) M. V. Babaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1480-1486.

Critically investigates methods used in the USSR. Apparently, data obtained by different laboratories vary greatly. Proposes a method involving repeated calcination, which will decrease the possible error. Tabulated comparative data from typical determinations indicate advantages of this method.

10B-28. Determination of Columbium in Stainless Steel by Means of the "Steeloscope". (In Russian.) V. I. Blinov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1494-1495.

Use of the Cb line of wave length 5095.3, since the other spectral lines are too close to those of W and Ti lines for certain identification.

10B-29. A Method for the Rapid Photometric Determination of Tungsten in Steels. A. A. R. Wood. *Metallurgia,* v. 39, Mar. 1949, p. 266-268.

After dissolving the sample in a sulfuric-phosphoric acid mixture and fuming to convert the tungsten to a phosphotungstic acid, an aliquot is taken and to it are added sodium thiocyanate and stannous chloride in concentrated HCl. By taking blank readings, interference from most metals is avoided.

10B-30. A Geiger-Muller Counter Method of Determinnig Phosphorus in Steels. Ford R. Bryan and George A. Nahstoll. *ASTM Bulletin,* Mar. 1949, p. 55-61.

See abstract from *Journal of the Optical Society of America.* Item 10b-42, 1948.

10B-31. The Determination of Combined Carbon in Cast Iron by Means of the Spekker Photo-Electric Absorptiometer. T. S. Harrison. *Journal of the Society of Chemical Industry,* v. 68, Feb. 1949, p. 49-52.

Method; data obtained.

10B-32. Fast Analysis of Acid Slags; Reflective Spectrophotometry Determines FeO-MnO-Cr. E. C. Zuppann and A. E. Martin. *American Foundryman,* v. 15, Apr. 1949, p. 126-132.

Development of a rapid method. A finely ground slag sample is mixed with oil and examined in the reflecting attachment of a standard spectrophotometer at a few key wave lengths. Reflective densities are translated into percentages of FeO, MnO, and Cr by reference to graphs. 12 ref.

10B-33. Determination of Tungsten and Columbium in Steel. (In Russian.) L. M. Budanova and K. D. Gavrilova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 7-11.

Possibility of separation of W and Cb by means of cupferron in the presence of fluoride salts. On the basis of this, a method of rapid colorimetric method for steels containing both metals was developed. The presence of up to 3% Mo does not interfere. 10 ref.

10B-34. Rapid Colorimetric Method for Tungsten Determination in Steel. (In Russian.) A. G. Bogdanchenko and A. D. Sapir. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 11-15.

New method applicable to W contents up to 1.5%. The most accurate results are obtained for W contents up to 0.50%. Time of determination is about 5 min.

10B-35. Determination of Molybdenum and Titanium in Ferroalloys and Steels by an Amalgamation Method. (In Russian.) P. Ya. Yakovlev and E. F. Pen'kova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 34-36.

Rapidity and accuracy of method are emphasized.

10B-36. Quantitative Spectrographic Determination of Carbon in Steels. (In Russian.) A. P. Oleinikov and K. I. Taganov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 59-62.

Use of the high-frequency discharge for spectrum excitation and a method of obtaining such a discharge by making certain modifications to a standard generator. Optimum operating conditions. Experimental results.

10B-37. Determination of Molybdenum in Alloy Steels Using the Photocolorimeter. (In Russian.) A. A. Tikhonova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 107-108.

The possibility of applying a photoelectric method of analysis. The formation of the complex of molybdenum with potassium thiocyanate in an acid medium in the presence of $SnCl_2$ is the basis of reaction.

10B-38. Rapid Method for Determina-

tion of Titanium in Alloy Steels Containing Chromium and Nickel. (In Russian.) Z. P. Gutkovskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 109-110.

Method based on the formation of the yellow compound $Ti(OH)_4$ or $TiO(SO_4)_2$ formed in the presence of H_2O_2.

10B-39. Automatic Welding of Thick Boiler Steels by Means of High-Power Arcs. (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Avtogennoe Delo* (Welding), Jan. 1949, p. 7-15.

Electric-arc welding of thick steel plate up to 90 and 100-mm. thickness. The main characteristics of this process are the high amperage, up to 1800 amp. at 40 volts, and a specially developed flux having high viscosity and high stabilizing (ionizing) properties. Optimum conditions of such welding and mechanical properties of welds. 10 ref.

10B-40. Die Bestimmung von Niob und Tantal in Stählen. (Determination of Columbium and Tantalum in Steels.) Maria Waterkamp. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 5-8.

Different methods for extracting the two elements in the form of their pentavalent oxides. The proposed methods are compared with those described in earlier literature. 13 ref.

10B-41. Röntgenographische Absorptionsanalyse legierter Stähle. (Radiographic Absorption Analysis of Alloy Steels.) Helmut Krainer. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 9-12.

Principles and a rapid method involving measurement of intensities by means of an electron-counting tube. A steel analysis for W and Ta.

10B-42. Spark Spectrum of Iron From 4650 to 2242 A. Ed. 2. A Gatterer and J. Junkes. *Specola Vaticana,* (Vatican City, Italy.) 1947, 24 pages.

Method of exposure, determination of wave lengths, and purpose of tables. Includes 13 spectrographic plates.

10B-43. The Method Used in the Murex Laboratories for the Determination of Tungsten in Ferrotungsten. E. A. Chidley. *Murex Review,* v. 1, No. 3, 1949, p. 58-59.

Details of gravimetric procedure.

10B-44. The Determination of Phosphorus in Haematite Iron and Steel by the Molybdenum Blue Method. T. S. Harrison. *Journal of the Society of Chemical Industry,* v. 68, Mar. 1949, p. 84-88.

Previous work and detailed theoretical and experimental analysis of Vaughan's method, showing how it can be incorporated in a composite system of analysis. 33 ref.

10B-45. Colorimetric Determination of Silicon in Low-Alloy and Carbon Steels. Uno T. Hill. *Analytical Chemistry,* v. 21, May 1949, p. 589-591.

Method based on the yellow silicomolybdate color is improved in accuracy and increased in range by utilization of a decolorized blank containing all the reagents used to produce the color. Suitable for routine analytical work. 19 ref.

10B-46. Vanadium as Phosphotungstovanadate; A Spectrophotometric Method. M. D. Cooper and Paul K. Winter. *Analytical Chemistry,* v. 21, May 1949, p. 605-609.

Four variations of procedure for determination of V in low-alloy steels.

10B-47. Colorimetric Determination of Aluminum in Steel; Use of 8-Hydroxyquinoline. Stephen E. Wiberley and Lewis G. Bassett. *Analytical Chemistry,* v. 21, May 1949, p. 609-612.

Simple, rapid, and accurate method for small quantities. Application to various types of samples. Effects of interfering elements and of variables such as wave length, pH, and amount of reagent.

10B-48. Spectrophotometric Determination of Iron in Ores With Kojic Acid. J. P. Mehlig and M. J. Shepherd, Jr. *Analytical Chemistry,* v. 21, May 1949, p. 642-643.

Procedure and typical results. 10 ref.

10B-49. Volumetric Determination of Iron; Liquid Zinc Amalgam and Chromous Chloride as Reductors. William D. Cooke, Fred Hazel, and Wallace M. McNabb. *Analytical Chemistry,* v. 21, May 1949, p. 643-644.

Procedure and typical results.

10B-50. Le dosage spectrographique de l'alumine dans les résidus d'oxydes métalliques. Application au dosage de l'oxygéne dans les aciers spéciaux. (Spectrographic Analysis of Aluminum in Metallic-Oxide Residues. Application to Determination of Oxygen in Special Steels.) R. Castro and J. M. Phéline. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 379-388.

To estimate alumina in steel, the calcined residue from a HCl solution of the metal is dissolved in potassium bisulfate by fusion, and an aqueous solution containing cobalt sulfate is made. This solution is sparked on copper electrodes, using a spark source without a synchronous interrupter, and the

Al lines are compared with those of Co. The oxygen content of the steel can sometimes be deduced from the alumina figure obtained in this way. 14 ref.

10B-51. The Determination of Copper in Nickel-Bearing Steels and Cast Irons: a Photometric Method. S. D. Steele and L. Russell. *Analyst,* v. 74, Feb. 1949, p. 105-112.

10B-52. Analysis of Nonmetallic Inclusions in Alloy Steel. (In Russian.) M. M. Shapiro and R. E. Grabarovskaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 259-264.

Method of separating stable nonmetallic inclusions according to their type. The type of inclusion is determined by its solubility in HCl or a mixture of HF and H_2SO_4. The technique of this method. Data from typical analyses.

10B-53. Determination of Carbides in Chromium-Nickel Steels Containing Molybdenum and Tungsten. (In Russian.) N. M. Popova and A. F. Platonova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 267-269.

New technique. Data from a typical determination.

10B-54. Methods of Determination of Carbides and Slag Inclusions in Steels. (In Russian.) Ya. T. Lukashevich-Duvanova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 269-274.

Comparatively analyzes existing methods, indicating the best methods for individual cases. Data from investigation of five different steels (C, V, Mo, Ti, and Cr).

10B-55. Method for Determination of Nonmetallic Inclusions in the Austenitic Steel EYaIT. (In Russian.) E. E. Cheburkova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 275-277.

Proposes application of an electrolytic method, using a 6% solution of $FeSO_4$ containing citrate and 7% NaCl at a current density of 0.5 amp. per sq. cm. Preliminary treatment, as well as the method itself.

10B-56. Photoelectric Method for Determination of Nitrogen in Steel. (In Russian.) V. F. Mal'tsev, F. M. Gertsman, and T. P. Temirenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 288-294.

Method developed for bonded nitrogen. 11 ref.

10B-57. Spectrograph Analysis of Very Small Samples of Steel. L. G. Young. *Engineer,* v. 187, May 27. 1949, p. 589-591.

Method for analysis of samples weighing as little as 0.005 g., all the usual elements being determined with the exception of phosphorus and sulfur. It is now possible to analyze most of the low-alloy and stainless steels. Extension to high speed steels containing up to 20% W is believed feasible.

10B-58. Polarographic Determination of Tin in Steel. W. E. Allsopp and V. R. Damerell. *Analytical Chemistry,* v. 21, June 1949, p. 677-679.

Procedures applicable to toolsteels and to plain carbon steels.

10B-59. Determination of Alumina in Steel; A Spectrochemical Method. R. H. Colin and D. A. Gardner. *Analytical Chemistry,* v. 21, June 1949, p. 701-704.

10B-60. Determination of Total Carbon in Pig Iron, High Carbon Iron, and Nodular Cast Iron. Roy E. Deas and Lillian T. Conradi. *Foundry,* v. 77, July 1949, p. 68-69.

Sieving technique using 40 and 100-mesh screens. The three portions obtained by screening the drill sample are weighed and analyzed separately. Typical results.

10B-61. Sur le dosage du fer métallique dans la poudre des minerais. (Determination of Metallic Iron in Mineral Powder.) Michel Portessis. *Comptes Rendus* (France), v. 228, Apr. 4, 1949, p. 1233-1234.

The apparatus of Schlösing-Grandeau, modified by Schulze-Tiemann, is used. The method gave very good results on siliceous rocks mixed with small quantities of known amounts of iron filings.

10B-62. Quantitative Spectrochemical Analysis of Cr-Ni(18-8) Steel, Using Solutions and a Hilger Medium Spectrograph. (In English.) J. Eeckhout. *Analytica Chimica Acta,* v. 3, May 1949, p. 377-382.

Analysis lines are given for Cr, Ni, Mn, Mo, Ti, Cu, and Cb in 18-8 steel. The average deviation for a single exposure varies from 4 to 9%.

10B-63. Separation of Beryllium From Iron by Solvents. R. S. Young. *Journal of Chemical Education,* v. 26, July 1949, p. 357.

Analytical procedure which is useful in the determination of small quantities of many elements in irons and steels.

10B-64. Indirect Colorimetric Method for Determining Lead in Steel. (In Russian.) A. M. Dymov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 395-397.

Method based on determination of Mo in a precipitate of lead molybdate.

10B-65. New Volumetric Method of Iron Determination. (In Russian.) B. N. Afanas'ev and A. V. Ural'skaya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 407-408.

Method is characterized by the use of the sodium salt of para-toluene sulfonchloramide.

10B-66. Beitrag zur Prufung der Stähle nach dem Funkenbild. (The Spark-Testing of Steels.) G. Halfter. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 149-150.

A suitable selection of colored filters can improve the accuracy of spark testing.

10B-67. Vergleichende Untersuchungen uber die Bestimmung des Sauerstoffs im Stahl. (Comparative Study of the Determination of Oxygen in Steel.) Paul Klinger. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 151-163.

Vacuum-melt, chlorine, and electrolytic methods. Results obtained in different laboratories are compared. 22 ref.

10B-68. Alloy Steel Analysis; Determination of Tungsten, Molybdenum, Vanadium. *Metallurgia,* v. 40, June 1949, 119, 121.

Based on article by R. Niericker and W. D. Treadwell, in *Helvetica Chimica Acta,* p. 1472-1483, item 10-136, 1946.

10B-69. New Potentiometric Method for Determination of Manganese. (In Russian.) N. A. Glebov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 609.

Method proposed by A. I. Busov. Experimental investigation indicates that this method enables ready determination of Mn contents of 0.1-95% in ferrous and nonferrous alloys without necessity for separation from Cr, Co, etc. Typical data for analysis of different types of steel.

10B-70. Photocolorimetric Method of Determination of Nickel in Steel Without Complex Formation. (In Russian.) A. I. Masurova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 610.

Method is briefly described.

10B-71. Volumetric Determination of Small Amounts of Iron; Chromous Chloride as Reducing Agent. William D. Cooke, Fred Hazel, and Wallace M. McNabb. *Analytical Chemistry,* v. 21, Aug. 1949, p. 1011.

Suitability for solutions containing 0.1-10 mg. of Fe.

10B-72. A Method of Determining the Tin Content of Tungsten High Speed Tool Steel. B. Bagshawe and E. Dyke. *Analyst,* v. 74, Apr. 1949, p. 249-252; discussion, p. 252-253.

Method involves separation of tungsten as the carbide from non-oxidizing acid media, removal of tin as the sulfide and its subsequent reduction to the bivalent state with metallic aluminum in presence of an antimony salt, and titration of the reduced tin with standard iodate solution.

10B-73. Analysis of High-Speed Tool Steels by the Spekker Absorptiometer. Determination of the Major Alloying Constituents: Tungsten, Chromium, Vanadium, Cobalt and Molybdenum. George J. Lennard. *Analyst,* v. 74, Apr. 1949, p. 253-257.

10B-74. The Method Used in the Murex Laboratories for the Determination of Molybdenum in Ferro Molybdenum. E. A. Chidley. *Murex Review,* v. 1, no. 4, 1949, p. 74.

10B-75. Zur Strahlungsanalyse von flüssigem Stahl. (Radiation Analysis of Molten Steel.) Gerhard Naeser and Gunther Engels. *Stahl und Eisen,* v. 69, July 21, 1949, p. 508-514.

Methods of improving the technique of analyzing steels by the radiations emitted from the molten metal. Effect of different alloying elements on radiation intensity and the relationship between radiation and steel quality. 16 ref.

10B-76. Note on Donaldson's Method for Determining Combined Carbon in Malleable Iron. H. A. Schwartz and G. M. Guiler. *American Foundryman,* v. 16, Sept. 1949, p. 53.

Modification of the original method, which gave inaccurate results when used on malleable iron.

10B-77. Magnesium in Cast Iron. W. R. Kennedy. *Foundry,* v. 77, Oct. 1949, p. 80-81, 182.

A recent method for causing nodular graphite structure in cast iron has made necessary a rapid and reliable method for determining its Mg content. Standards were obtained from experimental heats in the form of $\frac{7}{32}$-in. diameter cast pins. Samples were analyzed by wet chemical methods. Procedure.

10B-78. Semiquantitative Spectral Analysis of Cast Irons. W. J. Price and A. Argyle. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 49-59.

A method of rapid estimation of traces and impurities. Line-pairs

suitable for estimations, and methods of calibration.

10B-79. Determination of Carbon in Coarse Graphite Materials. W. Westwood and F. A. Hooper. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 61-66.

Ordinary combustion, direct combustion, and the copper potassium chloride method. The first was found to be entirely unsatisfactory for coarse graphite materials. The other two are satisfactory when applied to solid samples of steel castings which have been carefully prepared.

10B-80. Melting Control With the Direct-Reading Spectrometer. Earl R. Vance. *Journal of Metals* (News Section), v. 1, Oct. 1949, p. 28-30.

Results of 2 years experience at Timken Roller Bearing Co.

10B-81. Gases in Cast Iron. J. E. Hurst and R. V. Riley. *Foundry Trade Journal,* v. 87, Sept. 29, 1949, p. 393-397; discussion, p. 397-400.

Results of experiments on the hot extraction method of gas analysis.

10B-82. Atomic Scientist's Aid Finds New Job Counting Alloy Factors in Steel. *Welding Journal,* v. 28, Oct. 1949, p. 465s, 483s.

New technique in which the Geiger counter is used for qualitative and quantitative analysis of steel. The steel atoms are ionized by intense X-rays. They then emit fluorescent rays which are detected by the Geiger counter.

10B-83. Determination of Nitrogen in Steel. John L. Hague, Rolf A. Paulson, and Harry A. Brignt. *Journal of Research of the National Bureau of Standards,* v. 43, Sept. 1949, p. 201-207.

Rapid semimicro method. Nitrogen is put into solution as ammonium sulfate by treatment of the sample with H_2SO_4 by steam distillation from an alkaline solution. The distillate is collected in boric acid solution, and the nitrogen determined by titration with 0.01 *N* acid. Effect of some common alloying elements on acid solubility of nitrogen compounds in steel. 30 ref.

10B-84. Distribution of Columbium in Ingot Steel. (In Russian.) G. N. Oiks, Yu M. Maksimov, and A. M. Dymov. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 661-662.

Investigated by gravimetric determination of Cb contents of shavings obtained by drilling an ingot at different points. The P and S contents were determined simultaneously.

10B-85. The Direct Reading Analysis of 18-8 Stainless Steels. M. F. Hasler. *Iron Age,* v. 164, Nov. 3, 1949, p. 96-99.

Spectrographic analysis is generally considered unsuitable for contents of elements greater than 5%. Development of the multiplier-phototube as a light-measuring device makes possible improvements in precision and speed of analysis and removes the contents limitation. Successful application of the technique to stainless steels.

10B-86. Geiger Counter Speeds Analysis of Alloy Steels. *Product Engineering,* v. 20, Nov. 1949, p. 154.

Apparatus and technique.

10B-87. Determination of Metallic Iron Contained in Bloom and Sponge Iron by Means of a Ferric Chloride Solution. Saburo Kitahara. *Journal of the Scientific Research Institute,* v. 43, Apr. 1949, p. 1-27.

Use of ferric and of mercuric chlorides for solution of metallic iron. Solubility determinations were made on various iron compounds likely to be present in sponge iron and bloom. Relative merits of the two methods. 42 ref.

10B-88. Photocolorimetric Analysis of Stainless Steel. (In Russian.) K. A. Shisterman and O. A. Yakovleva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 782-785.

Describes method for stainless steel containing up to 5% Mo in the presence of 16-19% Cr and 12-14% Ni. Course of analysis is described for determination of Si, Ni, Ti, and Mo. Time required is 30-40 min.

10B-89. Microchemical Determination of Carbon in Ordinary and Alloy Steels. (In Russian.) A. I. Glazova and E. I. Nikitina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 847-848.

Method based on combustion of carbon to the dioxide and determination of the latter by use of liquid air. Conditions of testing and typical data.

10B-90. New Semi-Micro Method for Determination of Sulfur in Cast Irons. (In Russian.) A. T. Chernyi and K. V. Podoinikova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 849.

Cast iron is broken into tiny particles which are sintered in a glazed porcelain tube with a mixture of oxalic acid and calcium filings. Time of test is 12-15 min. Applicability of method is confirmed on test specimens of specular and foundry-pig cast iron containing 0.023-0.284% S.

10B-91. Spectroscopic Analysis of Basic Openhearth Slags. (In Russian.) O. I.

Nikitina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 855-857.

Lines in the 2700-3200 A region were used. Specific conditions for determination of CaO, SiO_2, MnO, and FeO are indicated.

10B-92. Spectrographic Determination of Phosphorus in Cast Iron. (In Russian.) M. S. Alpatov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 857-858.

Recommended procedure and typical data.

10B-93. Einfache Methoden zur Unterscheidung von Stählen. (Simple Methods for Identification of Steels.) W. Küntscher and H. Kilger. *Chemische Technik,* v. 1, Sept. 1949, p. 93-97.

Qualitative spot-test methods.

10B-94. The Determination of Chromium in Cast Iron and Steel. T. S. Harrison and H. Storr. *Analyst,* v. 74, Sept. 1949, p. 502-504.

Application of modified bromate oxidation process to the determination of Cr in a variety of ferrous alloys. The analyses may also be completed volumetrically, the end-point being very definite.

10B-95. Spektrograficke stanoveni hliniku a tatanu v ocelich. (Spectrographic Determination of Aluminum and Titanium in Steels.) Josef Kuba. *Hutnické Listy,* v. 4, Aug. 1949, p. 237-241.

Methods developed in a Czechoslovakian steel-mill laboratory.

10B-96. Rapid Method of Determination of Iron Oxide in Agglomerates. (In Russian.) N. Z. Plotkin, Yu. I. Usatenko, and P. A. Bulakhova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 999-1000.

New method based on ability of ferrous oxide to be oxidized during annealing. It requires only 7-10 min. Typical results.

10B-97. Methods for Chemical Control of the Surface Preparation of Steel Wire. (In Russian.) I. I. Vainshenker and Z. I. Granik. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 1006-1007.

Analytical methods used in control of the pickling bath.

10B-98. Local Spectrographic Analysis of Low-Alloy Steel. (In Russian.) W. G. Isaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 1010-1011.

Electric circuit that limits surface destruction not only in depth but also to the smallest possible area.

10B-99. Sampling and Analysis of Steel for Hydrogen. G. Derge, W. Peifer, and J. H. Richards. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 219-246; discussion, p. 246-247.

Previously abstracted from *Metals Technology.* See item 10b-43, 1948.

10B-100. Apparatus for the Hot-Extraction Analysis for Hydrogen in Steel. C. E. Sims and G. A. Moore. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 248-257; discussion, p. 257-259.

Previously abstracted from *Metals Technology.* See item 10b-44, 1948.

10B-101. Le dosage de l'oxygène dans l'acier liquide. Application à l'acier Martin basique. (Determination of Oxygen in Liquid Steel. Application to Basic Openhearth Steel.) M. Lacomble and M. Nepper. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 561-565; discussion, p. 565-566.

An improved Herty method. Advantages, particularly with respect to rapidity, low cost, and accuracy.

10B-102. Molybdenum Separation in Iron Alloys. R. S. Young and A. Leibowitz. *Iron Age,* v. 164, Nov. 24, 1949, p. 75-76.

Various reference sources disagree on the behavior of Mo in the ether-extraction method for separating Fe. Investigation conducted to determine more clearly the proportion of Mo accompanying Fe into the upper ether layer.

10B-103. Steel Analysis Time Cut by Radio Frequency Heating. W. K. Aites. *Steel,* v. 125, Dec. 12, 1949, p. 92-93, 112.

Use of high-frequency induction heating in carbon and sulfur analysis. Temperatures exceeding 3000° F. are used, reducing carbon determination time from 10 to 2½ min.

10B-104. Étude de la répartition des éléments entre les phases l'un alliage. Influence de la cémentite sur les intensités relatives des raies du fer. (Study of the Distribution of Elements Among the Phases of an Alloy. Influence of Cementite on the Relative Intensity of Iron Lines.) Henri Triche. *Comptes Rendus* (France), v. 229, Oct. 3, 1949, p. 652-653.

Experimental results of study by means of spectrography may be adversely affected by interaction of the source with one of the constituents. In the case of Fe-C alloys, increase in the intensity of the iron lines is related to the thermal action of the source on the cementite. This phenomenon partially contributes to "fatigue" of the spark.

10B-105. Identification of Carbon Steels by Spark Testing. *Machinery* (London), v. 75, Nov. 17, 1949, p. 716-717.

From article by W. Jaenicke and G. H. Saul, *Stahl und Eisen,* v. 68, Aug. 12, 1948, p. 301-303.

Contends that representation of the various forms of spark is not satisfactorily obtained by photography. Recommends hand-drawn "spark pictures" for steels of varying carbon content and for Si steel.

10B-106. Potentiometrische Bestimmung von metallischem Eisen, festen Eisenoxydul, Eisenoxyd und löslichen zwei- und dreiwertigen Eisensalzen nebeneinander. (Potentiometric Determination of Metallic Iron, Solid Ferrous Oxide, Iron Oxide, and a Mixture of Insoluble Bivalent and Trivalent Iron Salts.) Bernhard Neumann and Gottfried Meyer. *Fresenius' Zeitschrift für analytische Chemie,* v. 129, no. 3, 1949, p. 229-232.

Ferric ions are reduced to ferrous ions by dissolving the solid mixture in alkaline, ammoniacal, or thiosulfate solutions and separating the soluble from the insoluble components by filtration.

10B-107. Fast Analysis of Acid Slags. Reflective Spectrophotometry Determines FeO-MnO-Cr. E. C. Zuppann and A. E. Martin. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 150-156; discussion, p. 156.

Previously abstracted from *American Foundryman,* item 10B-32, 1949.

10B-108. Bestimmung von metallischem Eisen neben Eisen-II-Oxyd und Eisen-III-Oxyd. (Determination of Metallic Iron in the Presence of Ferrous and Ferric Oxides.) Hans Ulrich v. Vogel. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 287-292.

Various methods including several more recent methods. The bromine-alcohol method was found to produce satisfactory results, provided the samples contain no more than 6% Mn. 34 ref.

10C—Nonferrous

10C-1. Solders and Babbitts; Routine Spectrographic Analysis. A. W. Danko and G. W. Wiener. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1178-1182.

A spark spectrographic method for analysis of Pb, Cu, Sb, and Sn in Sn-base solders and babbitts and Pb-Sn solders. The precentage ranges include Cu from 0.10 to 7.50; Sb, 0.10 to 2.50; Pb, 0.10 to 2.00; and Sn in Pb-Sn solders from 25.0 to 70.0. Cu, Sb, and Pb working curves are plotted as log intensity vs. log concentration.

10C-2. Chemistry of Thorium; Quantitative Estimation of Thorium by Precipitation With Radioactive Pyrophosphate. Therald Moeller and George K. Schweitzer. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1201-1204.

10 references.

10C-3. Spectrophotometric Determination of Iron and Titanium in Cathode Nickel. G. Victor Potter and Clarence E. Armstrong. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1208-1209.

Rapid and reproducible method depending upon formation of iron and titanium complexes of disodium 1,2-dihydroxybenzene-3,5-disulphonate.

10C-4. Colorimetric Determination of Rhenium. A. D. Melaven and K. B. Whetsel. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1209-1211.

Method described is aplicable to solutions containing up to 0.9 mg. of Rh in the presence of 1 mg. of Mo in a total volume of 100 ml. The Mo is precipitated from H_2SO_4 by α-benzoinoxime and separated from the rhenium by filtration. The rhenium is determined by forming the rhenium thiocyanate color complex and measuring the transmittance of the solution. 10 ref.

10C-5. Colorimetric Determination of Copper in Tin and Lead-Base Alloys. Milton Sherman. *Iron Age,* v. 162, Dec. 23, 1948, p. 62-63.

New and more rapid method (20 min.) utilizing sodium dimethyl dithiocarbamate as the colorimetric reagent.

10C-6. Electrometric Determination of Nickel and Copper. (In Russian.) V. G. Sochevanov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1255-1256.

Critically analyzes the method proposed by S. K. Chirkova. Indicates that only the sum of the copper and nickel present may be determined by this method and that the basic problem of their direct determination by one test remains as yet unsolved.

10C-7. Determination of Small Amounts of Tin in Alloys; Isolation by Adsorption of Stannic Acid on Manganese Dioxide. (In English.) S. Kuhnel Hagen, Niels Hofman Bang, and Poul Gjertsen. *Acta Chemica Scandinavica,* v. 2, No. 4, 1948, p. 343-351.

On the basis of the fact that colloidal and dispersed antimonic acid is readily adsorbed by manganese dioxide, a convenient and rapid method for the isolation and determination of small percentages of tin was developed.

10C-8. Massanalytische Bestimmung einer Reihe von Metall-Ionen durch Phosphattitration. (Quantitative Deter-

mination of a Series of Metal Ions by Phosphate Titration.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 99-106.

A procedure for determining ions of Ba, Sr, Ca, Mg, Al, Cr, Pb, and U.

10C-9. Bleibestimmung durch Umwandlung des elektrolytisch abgeschiedenen Blei IV-oxyds mittels Erhitzens zu Blei II-oxyd. (Determining Lead by Converting Electrodeposited Quadrivalent Lead Oxide Into Trivalent Lead Oxide by Heating.) L. Hertelendi and J. Jovanovich. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 151-158.

Since electrodeposited lead oxide never quite corresponds to the formula PbO_2, the author proposes its reduction to Pb_3O_4 or PbO. Experimental procedure and results.

10C-10. Neuer katalytischer Nachweis von Molybdan. (A New Catalytic Method for Detection of Molybdenum.) Rudolf Lang. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 165-166.

Colorimetric method involving use of methylene blue.

10C-11. Die quantitative Fallung von Blei als basisches Bleisalicylat. (The Quantitative Precipitation of Lead in the Form of Basic Lead Salicylate.) I. G. Murgulescu and Filofteia Dobrescu. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 203-206.

Experimental data.

10C-12. Potentiometrische Titrationen mit Kaliumjodat II. Die potentiometrische Bestimmung des Thoriums. III. Die potentiometrische Bestimmung des Lanthans. (Potentiometric Titration With Potassium Iodate. II. Potentiometric Determination of Thorium. III. Potentiometric Determination of Lanthanum.) G. Spacu and P. Spacu. *Fresenius' Zeitschrift fur analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 226-231.

10C-13. Analytische Untersuchungen uber das Thallium I-Ion. Potentiometrische Bestimmung von Thallium I-Ion als Thallium-Calciumeisencyanid. V. Mitteilung. (Analytical Research on Monovalent Thallium Ions. Potentiometric Determination of Monovalent Thallium Ions as Thallium Calcium Iron Cyanide. Report V.) Raluca Ripan and E. Popper. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 239-241.

10C-14. Bestimmung und Phosphattitration des Kobalt (II)-Ions durch Uberfuhrung in Ammoniumkobalt (II) -phosphat. (Determination and Phosphate Titration of Cobaltous Ions by Converting Them Into Ammonium Cobalt (II)-Phosphate.) Hugo Krause. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 128, Nos. 2-3, 1948, p. 241-248.

Determination of the above alone and in the presence of several other heavy-metal ions.

10C-15. The Determination of Aluminium in Aluminium Bronze. W. T. Edwards. *Analyst,* v. 73, Oct. 1948, p. 556-557.

Interfering metals are either removed or suppressed, and Al is precipitated with 8-hydroxyquinoline solution under carefully controlled conditions. The method was found suitable for both routine and reference work; a single determination takes 2-3 hr.

10C-16. Effect of Melting Conditions on the Spectrographic Determination of Copper in Lead Alloys. L. C. Bannister and R. H. Price. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 151-162.

An accurate and convenient method for preparing Pb-Cu alloy standards for spectrographic analysis involves heating the surface of molten metal directly with a coal-gas flame, which dispels the oxide present and enables solid copper to dissolve more rapidly than usual in lead alloys. Preparation of a number of Pb-Sn-Cu and Pb-Sb-Cu alloys is described. Effect of small amounts of Sb on the determination of Cu.

10C-17. Method for the Spectrochemical Determination of Beryllium, Cadmium, Zinc, and Indium in Ore Samples. Graham W. Marks and Betsy M. Jones. *Bureau of Mines,* Report of Investigations 4363, Nov. 1948, 27 pages.

Outline of the method, standard curves, and tables showing results for various ores and effects of constituents of various minerals and compounds on line intensities. 28 ref.

10C-18. La determinazione del manganese nei metalli non ferrosi e nelle loro leghe col metodo al persolfato-arsenito. (Determination of Manganese in Nonferrous and Light Alloys by the Persulphate-Arsenite Method.) Gaetano Gavioli. *La Metallurgia Italiana,* v. 40, Sept.-Oct. 1948, p. 188-191.

Data from a typical determination are compared with those obtained by other methods. Advantages of the method. 16 ref.

10C-19. Isotope Shifts in Uranium Spectra. L. E. Burkhart, George Stukenbroeker, and Sam Adams. *Physical Review,* ser. 2, v. 75, Jan. 1, 1949, p. 83-85.

A study was made of the isotopic

shift of U^{238}, U^{235}, and U^{233}. The shift is sufficient to allow quantitative determination of the components of a mixture of the uranium isotopes by routine spectrographic analysis. Comparative values obtained by mass spectrometer and spectrograph.

10C-20. Chemical Research—Analytical. J. I Watters, Mark Fred, S. Sheel, Irene Corvin, and W. Byerly. *U. S. Atomic Energy Commission,* AECD-1988, May 18, 1948, 16 pages.

Data on gases evolved during the detarring of graphite crucible assemblies used in vacuum-fusion method for determination of oxygen. Attempts to increase accuracy of the copper-spark method in uranium analysis; several polarograph cells which have been used successfully with as little as 100 to 200 microliters of solution; experimental data obtained in the polarography of uranyl solutions in H_2SO_4 and HCl.

10C-21. Photographie des Fluoreszenzspektrums schwacher oder millimeterkleiner Leuchter. (Uran-Nachweis mit der Natriumfluoridperle, Untersuchung fluoreszierender Thermalwasserabsätze und dergl.) (Photography of Weak Fluorescence Spectra or Those From Sources Smaller Than a Millimeter in Cross-Section. (Uranium Detection by Means of Sodium Fluoride Beads, Investigation of Fluorescing Hot-Spring Deposits and the Like.)). Ferd. Scheminzky. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 191-205.

Fluorescence spectrography permits not only qualitative determination of uranium, present in small quantities in waters of different origin or in minerals, but also quantitative determination of uranium through spectrophotometry. Construction of a miniature spectrograph which produces good photographic spectra with relatively short exposure times even for very small samples. 12 ref.

10C-22. Dosage du Bismuth dans les Plombs industriels. (Determination of Bismuth in Commercial Lead.) L. Bertiaux and R. Théry. *Bulletin de la Société Chimique de France,* Sept.-Oct. 1948, p. 1017-1019.

Bismuth is precipitated in the presence of lead by potassium bromate in alkaline solution.

10C-23. Le dosage pondéral de l'uranium (étude des précipités a l'aide de la thermobalance de Chevenard). (Gravimetric Determination of Uranium (Study of Precipitates Using Chevenard's Thermobalance).) Clément Duval. *Comptes Rendus* (France), v. 227, Oct. 4, 1948, p.679-681.

Existing methods of uranium determination. Optimum conditions for the above gravimetric technique.

10C-24. Volumetric Determination of Tin in Copper-Base Alloys. Milton Sherman. *Foundry,* v. 77, Feb. 1949, p. 87, 240, 242, 244.

A rapid volumetric method for tin in which the time of reduction is reduced to a few minutes. The sample is dissolved in 30% H_2O_2 and HCl and the tin is separated from the copper by an NH_4OH precipitation. A revised procedure incorporates several improvements.

10C-25. Fractional Titration of Amalgams as a Method of Analysis of Low-Melting-Point Metals. (In Russian.) V. A. Tsimmergakl and R. S. Khaimovich. *Zavodskaya Laboratoriya* (*Factory Laboratory),* v. 14, Nov. 1948, p. 1289-1300.

Mathematical formulations of conditions of separation of metals (zinc, cadmium, tin, lead, bismuth). Technique of application of the method. Data are compared with those obtained by usual methods.

10C-26. Utilization of the Method of Fractional Leaching of Amalgams for Polarographic Determination of Small Concentrations of Low-Melting-Point Metals. (In Russian.) V. A. Tsimmergakl and R. S. Khaimovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1313-1318.

Determining Zn in Cd and Pb at concentrations of 0.0005-0.001% and also small amounts of Pb in Bi.

10C-27. Determination of Lead in Tin Bronzes. (In Russian.) Z. S. Mukhina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1388.

A polarographic method using a 15% solution of phosphoric acid. Lead may be determined in amounts of 0.5% and above.

10C-28. A Direct Determination of Aluminum in Zinc Base Die Casting Alloys. Milton Sherman, *Die Castings,* v. 7, Feb. 1949, p. 24, 64-67.

Modified procedure using Alizarin red S and thioglycolic acid.

10C-29. Polarography of Selenium and Tellurium. II. The +4 States. James J. Lingane and L. W. Niedrach. *Journal of the American Chemical Society,* v. 71, Jan. 1949, p. 196-204.

11 references.

10C-30. A Method for Spectrochemical Determination of Silver in Ore Samples. Graham W. Marks and E. V. Potter. *Bureau of Mines.* Report of

Investigations 4377, Dec. 1948, 14 pages.
Total-energy method.

10C-31. Drop Method for Detection of Iridium, Palladium, Platinum, Thallium, and Copper. (In Russian.) N. A. Tananaev, N. P. Ruksha, and A. N. Verkhorubova. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 271-275.

10C-32. Physiochemical Analysis of Systems Important in Analytical Chemistry. XIV. Investigation of the System K_2PdCl_4-KI-H_2O by the Method of Light Absorption. (In Russian.) I. V. Tananaev. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 276-283.

Applied to quantitative determination of palladium by turbidimetric, potentiometric, gravimetric, and colorimetric methods. A colorimetric method based on formation of PdI_4 ion is developed. 15 ref.

10C-33. Reaction of Nickel Ion With Dimethylglyoxine in the Presence of Oxidation Agents. (In Russian.) A. K. Babko. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 284-289.

The molar coefficient of extinction is convenient for comparison of the sensitivity of reactions. The sensitivity of this reagent in the case of nickel increases three-fold in the presence of oxidation agents. Optimum conditions for nickel determination.

10C-34. Investigation of the Precipitation of Heavy-Metal Ferrocyanides by an Amperometric Method. I. Investigation of the Precipitation of Copper Ferrocyanide. (In Russian.) N. G. Chovnyk and G. A. Kleibs. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 303-313.

Quantitative determination of copper by potassium ferrocyanide in an acid medium in a 1.0-5.0 N solution of potassium salts is proposed.

10C-35. Nonferrous Metallurgy. H. V. Churchill. *Analytical Chemistry,* v. 21, Feb. 1949, p. 246-249.

Scope of use of techniques and procedures and their application to analysis of nonferrous metals. Trace analysis, colorimetric methods, and polarographic procedures. 33 ref.

10C-36. Determination of Zirconium by Precipitation From Homogeneous Solution. Hobart H. Willard and R. B. Hahn. *Analytical Chemistry,* v. 21, Feb. 1949, p. 293-295.

Method for determining in samples containing 2 to 60 mg. of zirconium oxide, for samples containing 0.2 to 200 mg.

10C-37. Shop Tests for Identifying Non-Ferrous Metals. *American Machinist,* v. 93, Feb. 24, 1949, p. 127.

A tabulation.

10C-38. The Quantitative Spectrographic Analysis of the Rare Earth Elements. III. Determination of Major Constituents in Complex Mixtures. Velmer A. Fassel. *Journal of the Optical Society of America,* v. 39, Feb. 1949, p. 187-193.

Previously abstracted from *U. S. Atomic Energy Commission,* MDDC-1777. See item 10c-42, 1948.

10C-39. L'analyse polarographique appliquée aux produits de la métallurgie du zinc. (Polarographic Analysis Applied to Products of the Metallurgy of Zinc.) René Favre. *Analytica Chimica Acta,* v. 2, Dec. 1948, p. 556-564; discussion, p. 564-565.

Estimation of traces of Pb, Cd, and Zn in concentrations up to 10%.

10C-40. Nioxime: A Reagent for Palladium. Roger C. Voter, C. V. Banks, Harvey Diehl. *U. S. Atomic Energy Commission,* MDDC-1095, July 9, 1947, 4 pages.

See abstract from *Analytical Chemistry,* item 10c-59, 1948.

10C-41. Quantitative Approximate Semimicro Determination of Cerium and Total Rare Earths in Ores and Minerals. (In Russian.) N. S. Poluektov and M. P. Nikonova. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Nov.-Dec. 1948, p. 354-361.

A method particularly adaptable for analysis under field conditions is proposed. Cerium is determined by a colorimetric reaction with H_2O_2 in carbonate solution in the presence of sodium citrate; total rare-earth oxides are determined by semimicrogravimetric method.

10C-42. The Determination of Hydrogen; A New Universal Microgasometric Method. Leonard P. Pepkowitz and Everett R. Proud. *U. S. Atomic Energy Commission,* AECD-2365, Oct. 29, 1948, 10 pages.

Method applicable to the determination of total hydrogen in organic, inorganic, metal-organic compounds, and the low melting metals. Its basis is the evolution of the hydrogen in the sample within a sealed iron capsule and complete diffusion of the liberated hydrogen through the walls of the capsule into a simple vacuum system. The hydrogen is then determined by measuring the reduction in pressure which occurs in a static system when the hydrogen is converted into water over hot copper oxide.

10C-43. Applications analytiques de la phénothiazine. (Analytical Applications of Phenothiazine.) Raymonde Duval. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 21-26.

Spot tests that permit detection of silver on a drop plate or on paper. Use of the reagent for detection of Fe in presence of U; also Hg in the presence of Ag. By combined use of phenothiazine and diphenylcarbazide it is possible to detect 0.54 γ of Ag in the presence of 100 times its weight of mercury.

10C-44. L'acide p-diméthylaminobenzylidene-thiobarbiturique et ses dérivés dans la recherche des métaux nobles. (p-Dimethylaminobenzene Thiobarbituric Acid and Its Derivatives in the Study of Noble Metals.) T. Pavolini and F. Gambarin. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 27-33.

Proposed as sensitive reagents for the noble metals, especially Ag and Pd. 12 ref.

10C-45. Diphenylbenzidine as a Reagent for Vanadium. (In English.) J. Hoste. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 36-37.

Spot-test reaction for qualitative detection.

10C-46. Tetrabromophenolsulphonphthalein as Adsorption Indicator. I. Volumetric Estimation of Thallium. II. Volumetric Estimation of Silver and Thallium. (In English.) R. C. Mehrotra. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 73-82.

21 references.

10C-47. Nachweis und Gravimetrische Bestimmung von Thallium mit 8-Hydroxychinolin und 2,5-Dibrom-8-Hydroxychinolin. (Identification and Gravimetric Determination of Thallium With 8-Hydroxyquinoline and 2,5-Dibromo-8-Hydroxyquinoline.) F. Feigl and L. Baumfeld. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 83-88.

10C-48. Sur la séparation analytique des arséniates de zirconium en vue du dosage de l'arsénic. (Concerning the Analytical Separation of the Zirconium Arsenates in Connection With the Determination of Arsenic.) M. Jean. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 96-99.

This separation is not likely to be quantitative, since the zirconium arsenates do not possess a fixed composition.

10C-49. Extraction et dosage de traces de rhénium, en particulier dans les molybdénites. (Extraction and Determination of Traces of Rhenium, in Particular in the Molybdenites.) Suzanne Tribalat. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 113-125.

A simple technique applicable when the weight ratio rhenium-ore is as low as 10^{-7}.

10C-50. The Microdetermination of Gold With Hydroquinone and o-Dianisidine. (In English.) Giulio Milazzo. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 126-136.

Simple method in which Au is precipitated as Au_2S_3, using CuS or PbS as collector, and determined by a titrated solution of hydroquinone (with o-dianisidine as indicator) after eliminating the collector and dissolving in aqua regia. Theory of the titration reaction; possible interferences of some metals of the Pt group. 31 ref.

10C-51. The Determination of Manganese by the Peroxidisulphate Method. (In English.) Folke Nydahl. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 144-157.

The determination by the periodate method requires a rather long period of heating. Investigation of the faster peroxidisulfate method which has been considered rather unreliable. It was concluded that this method is at least as accurate as the periodate method, and is more rapid.

10C-52. Le dosage électrolytique du thallium. (Electrolytic Determination of Thallium.) Jean Besson. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 158-162.

Numerous methods compared. Cathodic deposition; use of a cathode made of Wood's metal or an amalgamated platinum cloth; anodic deposition; gravimetric determination by means of thioanilide is easier and more accurate.

10C-53. Spectrographic Analysis of High-Cobalt (Vitallium) Alloys. Y. T. Sihovonen, D. L. Fry, R. E. Nusbaum, and R. R. Baumgartner. *Journal of the Optical Society of America,* v. 39, Mar. 1949, p. 257-260.

A method used for control purposes in casting Vitallium is described. Improvements made in the course of the work. Reproducibility and accuracy data. Shows that a great deal of analytical work can be done with a spectrograph even though accurate comparison standards are not available.

10C-54. Polarography of the Various Oxidation States of Tungsten. James J. Lingane and Lyndon A. Small. *Journal of the American Chemical Society,* v. 71, Mar. 1949, p. 973-978.

An investigation of the above in hydrochloric acid, together with application of controlled potential electrolysis to the interpretation of po-

larograms and the preparation of lower oxidation states. 20 ref.

10C-55. Chemical Analysis of Tin-Containing Minerals of the Platinum Group. (In Russian.) P. V. Faleev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1422-1423.

A new method, based on introduction of H_2SO_4 during the dissociation of above minerals, thus avoiding loss of tin which takes place when using ordinary methods. Cementation of the platinoids by mercury greatly simplifies the analysis.

10C-56. Amperometric Titrations With Indicators. (In English.) Anders Ringbom and Borje Wilkman. *Acta Chemica Scandinavica,* v. 3, No. 1, 1949, p. 22-28.

New principle, the use of indicator substances, which makes it possible to determine certain metals not previously analyzed polarographically. The disturbing influence of many metals with low half-wave potentials is eliminated. Determinations of Al, Mg, and Ca.

10C-57. Organic Reagents for Platinum Metals. I. Determination of Palladium With 1,10-Phenanthroline. D. E. Ryan and P. Fainer. **II. The Gravimetric Determination of Rhodium.** R. L. Haines and D. E. Ryan. *Canadian Journal of Research,* v. 27, sec. B, Feb. 1949, p. 67-75.

10C-58. Separation of Cadmium From Large Quantities of Zinc. C. W. Barker, M. Cahill, and R. S. Young. *Metallurgia,* v. 39, Mar. 1949, p. 260.

Procedure applicable to solutions of high Zn content using Zn dust in warm dilute H_2SO_4. The method has been found to give faster results than the usual analytical method.

10C-59. Cobalt Estimation; Methods Available for Bright Nickel Solutions. H. D. Carter. *Metal Industry,* v. 74, Mar. 25, 1949, p. 226-228.

See abstract from *Journal of the Electrodepositors' Technical Society,* item 10A-37, 1949.

10C-60. (Book.) **Rationelle Metallanalyse.** (Rational Metal Analysis.) A. Cohen. 404 pages. 1948. Verlag Birkhäuser, Basel, Switzerland.

Selected chemical methods of analyzing the alloys of Al, Pb, Cu, Mg, Zn, and St. Principles of analyzing metals by chemical means, as well as basic operations, equipment, and materials. Quantitative data on adsorption, mixed precipitation, mixed distillation, and similar sources of error.

10C-61. Determination of Rare Earth Elements in Uranium Compounds. R. C. Hirt and N. H. Nachtrieb. *U. S. Atomic Energy Commission,* MDDC-903; LADC-274, June 24, 1944, 4 pages.

Separation may be obtained by means of an ether extraction, precipitation as fluorides, and purification by way of the hydroxides. The final determination is carried out spectrographically. Dysprosium, gadolinium, samarium, neodymium, praseodymium, lanthanum, and cerium were investigated, and their limits of sensitivity and their recoveries from U_3O_8 determined. The method may be applied to other rare earth elements as well.

10C-62. Extraction of Cerium (IV) Nitrate by Butyl Phosphate. J. C. Warf. *U. S. Atomic Energy Commission,* AECD-2524, Aug. 7, 1947, 10 pages.

Cerium (IV) nitrate is readily extracted from aqueous solutions by tri-n-butyl phosphate, a solvent which is reasonably stable under strongly oxidizing conditions. By oxidation with bromates and simultaneous exhaustive extraction by butyl phosphate, the cerium may be quantitatively extracted. The degree of separation of cerium from iron, zirconium, lanthanum, and praseodymium.

10C-63. The Colorimetric Determination of Traces of Bismuth in Lead. C. W. Ballard and and E. J. Ballard. *Analyst,* v. 74, Jan. 1949, p. 53-54.

Methods described by Robinson and by Zischkau. Points out disadvantages of these methods and outlines modified method. Comparative results.

10C-64. Le dosage pondéral du thorium. (Etude des précipités a l'aide de la thermobalance de Chevenard.) [Gravimetric Determination of Thorium. (Study of Precipitates With Aid of the Chevenard Thermobalance.)] Thérese Dupuis and Clément Duval. *Comptes Rendus,* v. 228, Jan. 31, 1949, p. 401-402.

Temperature limits of stability of a series of solid compounds of Th, prepared by use of different precipitating reagents. The data are discussed in terms of suitability of the different reactions for application to gravimetric determination of Th.

10C-65. Electrolytic Determination of Copper in Brasses and Bronzes, Tin-Base Alloys, and Aluminum Alloys by Use of Phosphoric Acid. George Norwitz. *Analytical Chemistry,* v. 21, Apr. 1949, p. 523-525.

The method is not applicable to Al alloys containing Sn, Sb, Bi, or Ag. 11 ref.

10C-66. Thorium Standard Samples. Clement J. Rodden. *U. S. Atomic Energy Commission,* MDDC-1220, June 1947, 18 pages.

Preparation by National Bureau of Standards as well as a series of methods for determination of Th and U in sands and ores. 11 ref.

10C-67. The Spectrochemical Determination of Hafnium-Zirconium Ratios. Cyrus Feldman. *U. S. Atomic Energy Commission,* AECD-2342, Oct. 14, 1948, 19 pages.

11 references.

10C-68. Application of a Titration Method to the Colorimetric Determination of Tungsten. (In Russian.) Yu. A. Chernikhov and R. S. Tramm. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 15-20.

Method for determination of tungsten in ores, based on formation of a colored thiocyanate-tungsten complex. Influence of different substances present. High sensitivity of this method, permitting determination of amounts as small as 0.0001%. 10 ref.

10C-69. Investigation of Colorimetric Methods of Bismuth Determination. (In Russian.) Yu. Yu. Lur'ei and L. B. Ginzburg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 21-30.

Existing methods for ores. Data are tabulated.

10C-70. Colorimetric Determination of Bismuth in Lead Using Thiourea. (In Russian.) A. I. Busev and N. P. Korets. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 30-34.

A simple, accurate, and rapid method. Influence of different additions on the accuracy of determination.

10C-71. Application of the Intermittent Spark for Quantitative Spectral Analysis of Metals in Solution. (In Russian.) K. G. Dmitriev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 63-65.

Method and factors involved. The method is particularly recommended for determination of Mg and Ni.

10C-72. Spectrographic Determination of Vanadium in Copper-Bearing Sandstones. (In Russian.) A. M. Shavrin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 66-69.

Proposes a new method, using a previously plotted calibration curve. Methods of preparing standard calibration curves. Probable error of a single determination was found to be about 5-13%.

10C-73. Preparation and Investigation of Silumin Standards With a High Zinc Content. (In Russian.) N. K. Tikhomirova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 112-114.

Details of preparation of standard silumin-alloy samples for spectrographic analysis. Compositions of the standards. Comparative results of chemical and spectrographic analysis.

10C-74. Volumetric Determinations in Strongly Alkaline Solutions. VI. An Oxidimetric Determination of Manganese and Cobalt. (In English.) O. Tomicek, Z. Sandl, and V. Simon. *Collection of Czechoslovak Chemical Communications,* v. 14, no. 1-2, 1949, p. 20-27.

Procedures and typical data.

10C-75. Dosage gravimétrique du vanadium au moyen de certains dérivés de la carbamides. (Gravimetric Determination of Vanadium Using Certain Carbamide Derivatives.) J. Fidler. *Collection of Czechoslovak Chemical Communications,* v. 14, no. 1-2, 1949, p. 28-39.

New method. Results compared with those obtained by other methods. Sample determinations were performed with each organic compound. Carbamide derivatives were used as precipitation agents.

10C-76. Dosage de l'uranium a coté du Ce^{III}, Tl^{I}, Ag, Pb, Cu, Hg^{II} et du ferricyanure de potassium au moyen de l'isatine-β-oxime. (Determination of Uranium and of Potassium Ferricyanide in the Presence of Ce^{III}, Tl^{I}, Ag, Pb, Cu, and Hg^{II} by Means of Isatine-β-Oxime.) V. Hovorka and Z. Holzbecher. *Collection of Czechoslovak Chemical Communications,* v. 14, no. 1-2, 1949, p. 40-58.

Methods applicable when each of the above ions is present individually, but not collectively.

10C-77. Sur une méthode d'analyse quantitative des variétés allotropiques du cobalt par les Rayons X. (An X-Ray Method for Quantitative Analysis of Allotropic Modifications of Cobalt.) Max Sage. *Comptes Rendus,* v. 228, Feb. 14, 1949, p. 572-574.

Theoretical basis of method. The technique of the analysis, using the microphotometer of Bouty; and the method of analysis of the experimental data. Results have a maximum possible error of ±5%.

10C-78. L'acide trithiobarbiturique dans la recherche de l'argent et du cuivre. (Trithiobarbituric Acid in the Investigation of Silver and Copper.)

T. Pavolini and F. Gambarin. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 180-182.

Recommends use of this reagent for identification of traces of Ag or Cu.

10C-79. Sur la thermogravimétrie des précipités analytiques. XVIII. Dosage du Scandium. (Thermogravimetric Analysis of Analytical Precipitates. XVIII. Determination of Scandium.) (Mme.) Jacques Dupuis and Clément Duval. XIX. Dosage du Praséodyme. XX. Dosage de l'Europium. XXI. Dosage de l'Aluminium. (XIX. Determination of Praseodymium. XX. Determination of Europium. XXI. Determination of Aluminum.) Therese Dupuis and Clément Duval. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 183-185; 186-188; 189-190; 190-205.

Continue series on use of the Chevenard thermobalance for gravimetric determination of various ions. Curves indicate proper temperature ranges for drying of different precipitates formed with the above elements. Only three salts each of Sc, Pr, and Eu were studied; but 24 for Al. Recommends new technique for the latter. 37 ref.

10C-80. A Rapid Mobile Analyzer for Minute Amounts of Lead in Air. Henry Aughey. *Journal of the Optical Society of America,* v. 39, Apr. 1949, p. 292-293.

Atmospheric contamination by lead presents acute problems in analysis and control in the chemical industry. Mobile instrument of extreme sensitivity which furnishes a rapid indication and an approximate assay of localized relatively high concentrations of lead, combined or elemental. Samples are drawn through a condensed spark discharge adjusted to minimize air lines and to excite the lead spectrum which is photographed with a small quartz instrument.

10C-81. Detection of Lead in Air With the Aid of a Geiger-Muller Counter. O. G. Koppius. *Journal of the Optical Society,* v. 39, Apr. 1949, p. 294-297.

Detector which utilizes a spark source for excitation of the lead spectrum, a small quartz spectrometer for dispersion, and a quartz Geiger-Muller counter for detection. The lower limit of detection is of the order of 20 micrograms per cu. ft. 10 ref.

10C-82. A Modified Method for the Determination of Chromium in Uranium or Its Compounds. C. E. Bricker and N. H. Furman. *U. S. Atomic Energy Commission,* MDDC-1616, June 19, 1943, 5 pages.

Reviews previous methods. Results of light-transmission method using uranyl sulfate solution which requires no separations or extractions.

10C-83. A Rapid Colorimetric Method for the Determination of Microquantities of Thorium. Robert H. Hall. *U. S. Atomic Energy Commission,* AECD-2437, Nov. 12, 1948, 13 pages.

Determination with an error of 2% or less through the formation of a colored complex with excess carminic acid in acid solution. The colored complex forms almost instantaneously in cold solutions, and is stable indefinitely at room temperature. Method is not satisfactory in the presence of Fe^{+++}, Fe^{++}, Al^{+++}, and organic material which form complexes of greater coordinate band strength.

10C-84. Volumetric Determination of Columbium. Howard B. Knowles and G. E. F. Lundell. *Journal of Research of the National Bureau of Standards,* v. 42, Apr. 1949, p. 405-408.

A procedure whereby Cb, in H_2SO_4 solution, is quantitatively reduced by amalgamated zinc to the trivalent form and subsequently oxidized to the quinquevalent state.

10C-85. Tungsten in Low-Grade Ores; Quantitative Spectrographic Determination. David Kaufman and S. K. Derderian. *Analytical Chemistry,* v. 21, May 1949, p. 613-616.

Method applicable to 0.001-0.13% tungstic oxide; as much as 50% Fe_2O_3 can be tolerated.

10C-86. Bestimmungsmethode fur Lithium in Mineralien. (Method of Determining the Lithium in Minerals.) Carl Boy. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, July 1948, p. 112-113.

Chemical methods applicable to different minerals.

10C-87. Gegenwärtiger Stand der polarographischen Analyse von Zink und Zinklegierungen. (Present Status of the Polarographic Analysis of Zinc and Zinc Alloys.) E. Koppitz and H. Moritz. *Metall,* July 1948, p. 223-228.

Surveys the most important known methods. Defects of these methods and possibilities of their improvement. 18 ref.

10C-88. Die Bestimmung von Zink in Kupfer, sowie von Nickel und Blei in Kupfer und in verschiedenen Kupferlegierungen. (Determination of Zinc, Nickel, and Lead in Copper and Different Copper Alloys.) Felix Jablonski. *Metall,* Aug. 1948, p. 258-262.

Polarographic method. 11 ref.

10C-89. Contribution a l'Analyse des Traces dans les Non Ferreux. Applications de la Méthode Spectrographique apres Concentration Chimique. (The Determination of Traces in Nonferrous Metals. Application of a Spectrographic Method After Chemical Concentration.) G. Sempels. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 346-353.

Combined chemical and spectrographic assay methods are outlined for Bi and Th in Pb and its ores (or those of Cd) and for Co and Ni in Zn.

10C-90. Dosage spectrographique du Niobium et du Tantale. (Spectrographic Determination of Columbium and of Tantalum.) P. Herman. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 389-396.

The method described makes it possible to determine 1-99% Cb or Ta in samples containing small amounts of Ti and W. The pentoxides separated by a simple chemical process are spectrographed on graphite electrodes in the d.c. arc at 10 amp. Less than 0.02 g. of pentoxides is sufficient.

10C-91. The Spectra of the Heavy Elements. Frank S. Tomkins. *Journal of the Optical Society of America,* v. 39, May 1949, p. 357-363.

Most prominent spectrum lines of the elements from protoactinium to americium.

10C-92. Analysis of Rare Earth Oxides by Means of Emission Spectra. Part I. Persistent Lines in Arc Spectra of Rare Earth Elements. D. M. Smith and G. M. Wiggins. **Part II. A Technique for the Suppression of Cyanogen Bands in Carbon Arc Spectra of Rare Earth Oxides.** G. M. Wiggins. *Analyst,* v. 74, Feb. 1949, p. 95-104; discussion, p. 104.

10C-93. The Estimation of Selenium in Lead Alloys. F. W. Box. *Analyst,* v. 74, Feb. 1949, p. 120.

Volumetric procedure. Typical results.

10C-94. Ammonium Thioglycolate as a Colorimetric Analytical Reagent for Uranium (VI) in the Presence of Various Anions. W. H. Davenport, Jr., and P. F. Thomason. *U. S. Atomic Energy Commission,* AECD-2398, Aug. 1, 1948, 7 pages.

Hexavalent uranium forms a yellow-orange soluble complex with the above in a basic solution. The complex is fairly stable and unaffected by many common anions. The method is best suited to the determination of U in the range 0.100-1.600 mg. in 25 ml.

10C-95. A Source of Error in the Colorimetric Estimation of Uranium. T. R. Scott. *Nature,* v. 163, May 14, 1949, p. 768-769.

Traced to the presence of $NaHCO_3$ formed in varying amounts when the acid solutions from ether extractions are treated with an excess of Na_2CO_3, prior to the addition of H_2O_2.

10C-96. A Method for the Spectrochemical Determination of Thallium in Ores, Concentrates, Dusts, and Chemicals. Graham W. Marks and E. V. Potter, *U. S. Bureau of Mines,* Report of Investigations 4461, May 1949, 13 pages.

Occurrence of Tl and choice of spectral lines for analyses. Experimental procedure. 14 ref.

10C-97. Dosage de faibles quantites de cadmium dans les minerais. (Determination of Small Amounts of Cadmium in Minerals.) Marcel Orliac. *Comptes Rendus,* v. 228, Mar. 14, 1949, p. 930-931.

A new method for the above in the presence of Zn. Sodium diethyldithiocarbamate in an ammoniacal medium is used. Separation of Cu, Pb, Bi, Sb, Sn, Al, and Fe. The final colorimetric determination was performed using a photo-electric cell. Method permits determination of 10 g. of Cd per ton of mineral with a possible error of 10%.

10C-98. Dosimétrie par absorption différentielle des rayons X, à l'aide de spectrometres a cristaux courbés et compteurs de Geiger. (Analysis by Differential Absorption of X-Rays, With the Aid of Curved-Crystal Spectrometers and Geiger Counters.) Yvette Cauchois and Kenneth Mac Taggart. *Comptes Rendus,* v. 228, Mar. 28, 1949, p. 1003-1005.

New technique is particularly applicable to determination of zirconium in hafnium, or vice versa. Formulas for calculation.

10C-99. Spectrographic Analysis of Thin Nickel Wires and Foils. (In Russian.) A. N. Prokop'eva and K. I. Taganov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 299-301.

Method for wires of up to 0.1-mm. diam. and foils of up to 0.01-mm. thickness of silicon, copper, and manganese. The spectrograph and the method of arc excitation. Typical results.

10C-100. Visual Method of Spectrographic Analysis According to Relative Intensity in Two Samples of Lines of the Elements Being Determined. (In Russian.) P. D. Korzh.

Zavodskaya Laboratoriya (Factory Laboratory), v. 15, Mar. 1949, p. 301-304.

Method, including the spectrographic set-up giving the most accurate results. Typical results for Cr and Cu.

10C-101. Beitrag zur Bestimmung kleinster Cadmium-, Wismut-, Eisen-, Blei-, und Zinn-Gehalte nach photometrischen Messmethoden. (Determining Traces of Cadmium, Bismuth, Iron, Lead, and Tin by Photometric Methods.) Georg Geuer. *Angewandte Chemie*, v. 61, Mar. 1949, p. 99-103.

Rapid method for impurities in refined Zn and Al. 14 ref.

10C-102. Uber eine einfache Farbreaktion auf Galmei-Zink. (A Simple Color Reaction on Calamine Zinc Salts.) Alfred Neuhaus. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 2, Feb. 1949, p. 55-58.

Simple method for detecting zinc in minerals and of roughly estimating its relative amount in the hydrate of zinc silicate.

10C-103. Colorimetric Determination of Uranium With l-Ascorbic Acid. G. G. Smith, E. F. Orlemann, A. A. Smales, C. D. Rothernberger, and W. R. Grines. *U. S. Atomic Energy Commission*, AECD-2101, Nov. 7, 1947, 16 pages.

18 references.

10C-104. Die spektralanalytische Bestimmung von Blei, Antimon, Eisen und Zink in Bronze und Rotguss. (Determining the Content of Lead, Antimony, Iron, and Zinc in Bronze and Red Brass.) Gerd Maassen. *Zeitschrift fur Erzbergbau und Metallhuttenwesen*, v. 2, Apr. 1949, p. 103-112.

Directions for rapid quantitative spectrochemical analysis of copper alloys. Typical results. 17 ref.

10C-105. Zur Analyse des Bleiglanzes. (The Analysis of Lead Glance.) Imre Sarudi (v. Stetina). *Fresenius' Zeitschrift fur Analytische Chemie*, v. 129, no. 2, 1949, p. 96-99.

Defects of the earlier methods and a more accurate and simpler method using HCl and $HClO_4$.

10C-106. Polarographic Determination of Pentavalent Antimony in the Presence of Pentavalent Arsenic. I. M. Kolthoff and R. L. Probst. *Analytical Chemistry*, v. 21, June 1949, p. 753-754.

10C-107. A Quantitative Study of the Reaction Between Beryllium and Quinizarin, 2-Sulfonic Acid. Myron W. Cucci, William F. Neuman, and B. J. Mulryan. *U. S. Atomic Energy Commission*, AECD-1990, May 1948, 10 pages.

Procedure for microanalysis of Be in solutions free of interfering substances, which permits determination of 1-20γ Be (20 ml. volume) with a probable error of less than 5%.

10C-108. A Spectrochemical Method for the Determination of Uranium. L. T. Steadman. *U. S. Atomic Energy Commission*, AECD-2267, Aug. 10, 1948, 19 pages.

Method uses a d.c. carbon arc with a medium quartz spectrograph, applicable to various source materials including animal tissues and fluids, ores, soil, and vegetation. Range of measurement is 0.05-10 μg of U on the arc. Error is about ±15%. 16 ref.

10C-109. Sur la thermogravimétrie des précipités analytiques. XXII. Dosage du Gallium. (Thermogravimetric Analysis of Analytical Precipitates. XXII. Determination of Gallium.) **XXIII. Dosage de l'Indium.** (Determination of Indium.) Thérese Dupuis and Clément Duval. **XXIV. Dosage de l'Uranium.** (Determination of Uranium.) Clément Duval. **XXV. Dosage du Chrome.** (Determination of Chromium.) Thérèse Dupuis and Clément Duval. *Analytica Chimica Acta*, v. 3, May 1949, p. 324-352.

Continues series in which the Chevenard thermobalance was used to determine the most suitable reactions for quantitative determination of various ions, and of optimum temperatures for conversion of the various compounds into forms suitable for weighing. 63 ref.

10C-110. Quantitative Determination of Antimony Using Rhodamine "V". (In Russian.) L. E. Sabinina and A. P. Zolotukhina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 398-401.

Method differing from that of Frederic with respect to acidity of the medium in which the complex is formed, final acidity, and type of acid used. Theoretical bases of the proposed method.

10C-111. Determination of Silicon in Tungsten Alloys. (In Russian.) E. F. Pen'kova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 475.

Method characterized by use of phosphoric acid. Results are compared with those obtained by a fusion method.

10C-112. Determination of Chromium and Nickel in Silver Without Use of Silver Nitrate. (In Russian.) A. G. Bogdanchenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 475-477.

Electrometric titration method

using the same sample for both determinations. Results of application to eight samples.

10C-113. Ein Prufgerat zur Werkstoffunterscheidung mit Hilfe des elektrolytischen Potentials. (An Apparatus for Classifying Materials on the Basis of Their Electrolytic Potentials.) Kurt Matthaes. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 194-195.

A simple instrument for rapidly sorting different Al-Mg, and Cu alloys and how it can be combined with the magneto-inductive testing process.

10C-114. The Electrolytic Estimation of Cadmium from Sulphuric or Perchloric Acid Solutions. G. H. Osborn. *Metallurgia,* v. 40, June 1949, p. 111-113.

Methods for the electrodeposition of Cd for analytical purposes are reviewed and critically discussed. None of these methods result in an ideal deposit and a modification is suggested by which it is possible to obtain quantitative results and a firm bright deposit. The method gives complete separation from Ni, Zn, and Cu. Bi, if present, would co-deposit, but this is said to be a rare contaminant. 15 ref.

10C-115. Metallindikatoren. I. Murexid als Indikator auf Calcium- und andere Metall-Ionen. Komplexbildung und Lichtabsorption. (Metal Indicators. I. Murexid as an Indicator of Calcium and Other Metal Ions. Complex Formation and Light Absorption.) G. Schwarzenbach and H. Gysling. *Helvetica Chimica Acta,* v. 32, June 15, 1949, p. 1314-1325.

Use of above organic reagent for analytical purposes. Color reaction with Sr, Ba, Mg, Zn, and Cd ions. Light-absorption curves.

10C-116. Iodometric Determination of Zinc. Eugene K. Maun and Ernest H. Swift. *Analytical Chemistry,* v. 21, July 1949, p. 798-801.

Under the conditions of the procedure recommended, the necessity for stepwise addition of ferricyanide and successive titrations of iodine is eliminated and a stable end point obtained. A precision of 1-2 parts per thousand can be expected. 16 ref.

10C-117. Dosage du thorium dans le tungstene thorie par la mesure de sa radio-activité. (Determination of Thorium in Thoriated Tungsten by Measurement of its Radioactivity.) M. Gallet. *Le Vide,* v. 4, March 1949, p. 585-590.

Laboratory experiments resulted in production of an apparatus for industrial use, particularly for the control of thoriated tungsten filaments used in incandescent lamps. Structural details and electrical circuit.

10C-118. Potentiometric Determination of Manganese in Nonferrous Alloys. (In Russian.) A. I. Busev and N. I. Dmitrieva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 515-517.

Oxidation of bivalent Mn to the trivalent form by permanganate in neutral pyrophosphate solution. Applicability to various copper alloys and duralumin.

10C-119. Etude de quelques propriétés physico-chimiques et analytiques du rhénium. (Study of Certain Physico-chemical and Analytical Properties of Rhenium.) S. Tribalat. *Annales de Chimie,* v. 4, May-June 1949, p. 289-351.

Results of an extensive study, with emphasis on the effects of different reducing agents on heptavalent Re compounds in HCl solution, and on qualitative determination of Re in the presence of high concentrations of Mo. 49 ref.

10C-120. Colorimetric Determination; Variation of Young-Hall Method for Rapid Determining of Copper in Lead Base Alloys. C. Goldberg. *Iron Age,* v. 164, Aug. 18, 1949, p. 88.

10C-121. The Polarography of Cadmium. *Scientific Apparatus and Methods,* Summer 1949, p. 72-76.

A review. 85 ref.

10C-122. Assayer's Guide. *U. S. Atomic Energy Commission,* AECD-2640, July 6, 1949, 77 pages.

Several methods for determination of U_3O_8 in ores, for uranium in ores and metals, and for ThO_2 in ores.

10C-123. Utilization of Waste Slag in Gold Assaying. L. A. Goedbloed. *Canadian Mining Journal,* v. 70, Aug. 1949, p. 81-82.

Cost savings. Recommended procedures.

10C-124. Quantitative Spectrochemical Determination of Lead and Zinc in Ores. Isidore Schnopper and Isidore Adler. *Analytical Chemistry,* v. 21, Aug. 1949, p. 939-940.

Method applicable to determination of 0.05-6% Pb and 0.05-6% Zn in Sb, Sn, and Cu ores. A statistical study of results as compared with those obtained by chemical analysis indicates no significant difference.

10C-125. Iodometric Determination of Copper; Effect of Thiocyanate on End Point and Use of Sulfate-Hydrogen Sulfate Buffers. Edward W. Hammock and Ernest H. Swift. *Analytical Chemistry,* v. 21, Aug. 1949, p. 975-980.

20 references.

10C-126. Routine Determination of Nickel in Cobalt-Base Alloys; Ferricyanide Oxidation of Cobalt. Louis Silverman and Herman K. Lembersky. *Analytical Chemistry,* v. 21, Aug. 1949, p. 983-984.

In ammoniacal solution, cobaltous salts are oxidized to the trivalent form by ferricyanide, and nickel is subsequently precipitated by dimethylgloxime in acetate buffered solution. One part N may be detected in the presence of 200 parts Co. W, Mo, Cr, Fe, Mn, Cb, and Ti do not interfere, hence no special separations are needed.

10C-127. Isoquinoline as a Reagent in Inorganic Analysis. Adolph E. Spakowski and Henry Freiser. *Analytical Chemistry,* v. 21, Aug. 1949, p. 986-989.

Some general aspects of the nature of the reaction between isoquinoline, the thiocyanate ion, and certain divalent cations. The reagent was applied to the determination of Cu in alloys and in ores with an accuracy of 3-4 parts per thousand in brasses, and 10-13 in the ores. Also provides a means for separation of Cu and Zn in brass with an average accuracy of ± 0.2 mg. 12 ref.

10C-128. Separation of Bismuth and Lead. (In Russian.) S. I. Busev. *Uspekhi Khimii* (Progress in Chemistry), v. 18, May-June 1949, p. 347-359.

On the basis of existing bibliographic data, it appears that simple rapid methods for such separation do not exist. Possibility of determination by potentiometric methods. 78 ref.

10C-129. Synthetic Standards for Spectral Analysis. (In Russian.) E. S. Kudelya. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 691-695.

Preparation of suitable standards by means of mixing and press forming of the desired metallic powders. Preparation of standards for determination of Mn and Al.

10C-130. Spectral Analysis of Metallic Lead. (In Russian.) A. I. Alekseeva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 700-703.

Method of determination of Bi, Sb, Sn, Cu, Zn, and Ag in Pb, which has recently been applied for control of the purification process in commercial lead production. Method of evaluating data. Results of typical determinations.

10C-131. Neue Vorschriften zur quantitativen Analyse durch innere Elektrolyse. (New Directions for Quantitative Analysis by Internal Electrolysis.) A. Schleicher. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 2, July 1949, p. 210-212.

New apparatus and directions for precipitation of Cu, Ni, Co, Sn, and Pb and for the separation of Cu from Cu pyrites, brass, bronze, and nickel silver.

10C-132. Eine Methode zur Wolframbestimmung. (A Method of Determining Tungsten.) Herbert Brintzinger, Fritz Rausch, and Martin Backhausen. *Zeitschrift für anorganische Chemie,* v. 255, Mar. 1948, p. 323-324.

The tungsten content of ores, slags, etc., can be quantitatively determined by dissolving them in Na_2S (Na_2SO_4 in a reducing atmosphere), followed by precipitation of tungstic acid.

10C-133. Electrolytic Separation of Rhodium From Iridium at Controlled Cathode Potential. William Marshall MacNevin and Samuel Miller Tuthill. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1052-1054.

Successfully accomplished using a circuit of the Lingane type. Adaptation of the separation to the Gilchrist-Wichers scheme for the Pt group metals. 11 ref.

10C-134. Analysis of Beryllium-Copper Alloys. Emma E. Baskerville. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1089-1091.

Cu is first removed and discarded. Be is generally determined first in the remaining solution, except when samples contain P or Zr, which must be removed. Ni and Co are determined in the solution after Be removal. Special modifications are used for Si and Cr. Ag is determined gravimetrically. 10 ref.

10C-135. Determination of Uranium (VI) in Presence of Anions; Ammonium Thioglycolate as a Colorimetric Analytical Reagent. W. H. Davenport, Jr., and P. F. Thomason. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1093-1095.

Previously abstracted under similar title from *U. S. Atomic Energy Commission,* AECD-2398. See item 10C-94, 1949.

10C-136. Colorimetric Determination of Columbium and Tungsten in High-Temperature Alloys. Isidore Geld and Jacob Carroll. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1098-1101.

Cb is determined as the yellow percolumbic acid produced by the action of H_2O_2 upon solutions of Cb in concentrated H_2SO_4. W is determined as the yellow thicyanate resulting from the action of $SnCl_2$ and KCNS upon solutions of tungsten. Interferences of other elements found in high-temperature alloys. 20 ref.

10C-137. Amperometric Titration. Part IV. Some Preliminary Experiments on

the Use of 8-Hydroxyquinoline. J. T. Stock. *Metallurgia,* v. 40, July 1949, p. 179-180; Aug. 1949, p. 229-230.

By use of small cells, milligram and microgram quantities of Cu, Zn, and Cd may be titrated with the above solution. The titration curve for Cu retains its shape for metal concentration as low as 1×10^{-4} M. Low solubility of its complex permits the titration of Cu in the presence of Cd but in the presence of Zn, coprecipitation occurs, as it does in Zn-Cd mixtures. Titration of Cd alone, or in the presence of Cu or Zn.

10C-138. The Estimation of Oxygen in Metals by Hydrogen Reduction. W. A. Baker. *Metallurgia,* v. 40, Aug. 1949, p. 188-189.

Modified British Non-Ferrous Metals Research Association apparatus to increase accuracy and speed of the above.

10C-139. Inorganic Paper Chromatography: the Qualitative Separation of Aluminium and Beryllium. G. H. Osborn and A. Jewsbury. *Nature,* v. 164, Sept. 10, 1949, p. 443-444.

10C-140. An Improved Method for Determination of Milligram Quantities of Vanadium in the Presence of Uranium. R. H. Gale and Eve Mosher. *U. S. Atomic Energy Commission,* AECD-2662, Aug. 3, 1949, 9 pages.

Method utilizes the reduction of quinquevalent vanadium to the vanadyl ion by ferrous ammonium sulfate. Accurate and precise determination of the equivalence point in this titration is made possible by use of a modified dead-stop titration apparatus and a micro-weight burette. 19 ref.

10C-141. A Laboratory-Cast Pin Sample for the Spectrographic Analysis of Copper-Base Alloys. E. W. Palmer, J. P. Irwin, and C. C. Fogg. *ASTM Bulletin,* Sept. 1949, p. 41-45.

Practical and inexpensive method developed for preparing pins of standard size and shape from any form of metallic sample (wire, sheet, heavy bars, drillings, etc.) received for spectrographic analysis by a brass-mill laboratory. The sample is reduced to fine chips, and a small portion remelted under argon in a specially designed graphite crucible which serves as the mold for the sample. Pins are machined to dimensions that vary with the excitation to be used and the elements to be determined.

10C-142. The Chromatographic Separation of Perrhenic and Molybdic Acids. Guy B. Alexander. *Journal of the American Chemical Society,* v. 71, Sept. 1949, p. 3043-3046.

Quantitative separation of Re and Mo can be made using Norit as adsorbent.

10C-143. Determination of Impurities in Electroplating Solutions. XIV. Traces of Calcium in Nickel Plating Baths. *Plating,* v. 36, Oct. 1949, p. 1034-1035, 1038-1040.

Apparatus and procedure. Accuracy and precision of method. 25 ref.

10C-144. Analysis of Oxygen in Titanium. Gerhard Derge. *Journal of Metals* (News Section), v. 1, Oct. 1949, p. 31-33.

A modification of the vacuum fusion techniques used for the analysis of gases in steel.

10C-145. Rapid Determination of the Calcium Content of Lead-Calcium Alloys by Titrating in the Molten State With Metallic Antimony. G. M. Bouton and G. S. Phipps. *Transactions of the Electrochemical Society,* v. 92, 1947, p. 305-311.

Previously abstracted from Preprint 92-13. See item 10-195, 1947.

10C-146. Steric Hindrance in Analytical Chemistry. Part I. Harry Irving, E. J. Butler, and M. F. Ring. *Journal of the Chemical Society,* June 1949, p. 1489-1498.

A series of quinoline and acridine derivatives was prepared and tested as potential precipitating agents in metal analysis and compared with the commonly used 8-hydroxyquinoline. Differences in behavior with Al explained in stereochemical terms.

10C-147. Studies in the Analytical Chemistry of Tungsten. IV. Separation of Tungstic and Arsenic Acids. D. A. Lambie. *Analyst,* v. 74, July 1949, p. 405-410.

Results of a critical study of methods for separation and determination of tungstic and arsenic acids. 12 ref.

10C-148. Metallo-Organic Reagents Used in Micro-Analysis. I. The Determination of Bismuth and Cadmium. F. Lester. *Metallurgia,* v. 40, Sept. 1949, p. 285-286.

Reagents and procedures. 18 ref.

10C-149. Visual Arc Spectroscopic Detection of Halogens, Rare Earths and Other Elements by Use of Molecular Spectra. Howard W. Jaffe. *American Mineralogist,* v. 34, Sept.-Oct. 1949, p. 667-674.

Cl, F, Br, Y, Sc, La, B, Al, Be, Ca, and Zr may be detected in minerals by visual arc spectroscopic observation of molecular or band spectra. The versatility of the simple bunsen spectroscope is greatly enhanced through application of molecular spectroscopy. A reference chart shows the most characteristic spectra of the visible region. 10 ref.

10C-150. Rapid Method for Determining Nickel on the Surface of Enameling Iron. L. C. Ikenberry and J. J. Canfield. *Journal of the American Ceramic Society,* v. 32, Oct. 1, 1949, p. 308-312.

Method requiring less than 5 min. Standard deviation was found to be 0.0028 g. of Ni per sq. ft. when testing a sheet carrying 0.10 g. per sq. ft.

10C-151. Über eine neue Zinkbestimmung auf photometrischem Wege. (A New Method of Determining Zinc by a Photometric Method.) W. Biberschick. *Metall,* v. 3, Mar. 1949, p. 80-82.

Working directions for a new indirect method using the Pulfrich step photometer. Proposed method is suitable for rapid analysis of alloys, especially of light-metals.

10C-152. Determination of Uranium in Ores. Modified Mercury Cathode-Cupferron Method. F. T. Rabbitts. *Canadian Mining Journal,* v. 70, Oct. 1949, p. 84-86.

Details of procedure. Includes as appendix a reprint of "Mercury Cathode Cell for Rapid Electrolysis", from *Analytical Chemistry.* See item 10A-28, 1948.

10C-153. Spectrochemical Determination of Hafnium-Zirconium Ratios. Cyrus Feldman. *Analytical Chemistry,* v. 21, Oct. 1949, p. 1211-1215.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2342. See item 10C-67, 1949.

10C-154. Determination of Microgram Amounts of Thorium; A Colorimetric Method. P. F. Thomason, M. A. Perry, and W. M. Byerly. *Analytical Chemistry,* v. 21, Oct. 1949, p. 1239-1241.

Method for the range 5-80 micrograms. Uranium and the rare earths do not interfere in amounts less than 1000 micrograms and interference from iron can be lessened by reduction to the ferrous state. 10 ref.

10C-155. Iodometric Semimicrodetermination of Thallium in Ores and Flue Dusts. Claude W. Sill and Heber E. Peterson. *Analytical Chemistry,* v. 21, Oct. 1949, p. 1268-1273.

10C-156. Organic Onium Compounds as Inorganic Analytical Reagents; Detection of Bismuth and Cobalt. Herbert A. Potratz and Jerome M. Rosen. *Analytical Chemistry,* v. 21, Oct. 1949, p. 1276-1279.

21 references.

10C-157. Determination of Tin in Manganese Bronzes. George Norwitz, Thomas F. Boyd, and Freda Bachtiger. *Analytical Chemistry,* v. 21, Oct. 1949, p. 1291.

Procedure in which Sn is quantitatively precipitated as metastannic acid. Interference of Fe is eliminated by simple procedural modifications.

10C-158. Absorptiometric Determination of Uranium. A. A. Smales and E. Furby. *Nature,* v. 164, Oct. 1, 1949, p. 579.

Effect of bicarbonate on the H_2O_2 method.

10C-159. Polarography of Quinoline Derivatives. Part IV. Amperometric Titration of Copper and Zinc With Quinaldinic Acid. John T. Stock. *Journal of the Chemical Society,* July 1949, p. 1793-1797.

Amperometric titration with quinaldinic acid of Cu, Zn, and Cd in concentrations less than 3×10^{-3} M. was studied. Cu and Zn are precipitated slowly in the cold, but titration is practicable at 60°. Under certain conditions Cu and Zn in the same solution may be successfully titrated, and Cu may be determined in the presence of Cd. Attempts to determine Cd either directly or by back-titration were unsuccessful.

10C-160. Use of Complexones in Chemical Analysis. (In English.) R. Pribil. *Collection of Czechoslovak Chemical Communications,* v. 14, no. 6, 1949, p. 320-330.

Various derivatives of imino diacetic acid and of phenyliminodiacetic acid have a remarkable ability to bind many cations in such a way that it is impossible to prove their presence by current analytical reactions. Because of their complex-forming character, they have been called "complexones". Determinations of Co, Mn, Cr, Mg and other metals.

10C-161. Un nuovo sistema di analisi spettrografica dei bronzi. (A New System for Spectrographic Analysis of Bronzes.) R. Berta and A. Palisca. *La Metallurgia Italiana,* v. 41, May-June 1949, p. 128-134.

Improved system for quantitative determination of Sn, Zn, Pb, and other elements in Cu-base alloys, especially cast bronzes. A counter electrode of very pure bismuth is used. Typical results show high accuracy.

10C-162. Sur la Thermogravimétrie des précipités analytiques. XXVII. Dosage du Thorium. (Thermogravimetric Analysis of Analytical Precipitates. Determination of Thorium.) Thérèse Dupuis and Clément Duval. **XXVIII. Dosage du Manganèse.** (Determination of Manganese.) Thérèse Dupuis, Jean Besson, and Clément Duval. *Analytical Chimica Acta,* v. 3, Sept. 1949, p. 589-605.

Weight-change curves obtained on drying the various compounds of Th

and Mn which may be precipitated in gravimetric analysis. Recommendations as to the most suitable compounds and drying temperatures. 58 ref.

10C-163. The Reduction of Antimonial Tin Solutions With Metallic Nickel and Cobalt. H. Holness. *Analyst,* v. 74, Aug. 1949, p. 457-461; discussion, p. 462.

Antimonial solutions containing 1.1% Sn were reduced by Ni powder and small coprecipitations of Sn were observed. When sheet nickel was substituted for powder, only a trace of retained Sn was noted. Experiments using metallic Co in place of Ni showed it to be less satisfactory.

10C-164. Application of Ion-Exchange Materials in Analytical Chemistry. IV. Determination of Sulfur, Phosphorus, and Arsenic in Nickel and Copper. (In Russian.) Yu. Yu. Lur'e and N. A. Filippova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 771-779.

Conditions for absorption of Cu and Ni from weakly acidic solutions, thus permitting determination of S, P, and As in these metals by well-known methods. Two variations of the colorimetric determination of As and P.

10C-165. Determination of Molybdenum in Ferromolybdenum With the Aid of a Cation-Exchange Material. (In Russian.) Yu. I. Usatenko and O. V. Datsenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 779-781.

New method using sulfocarbonate. Influence of different factors, such as acidity.

10C-166. A Precise Volumetric Method for the Determination of Uranium in Uranium Oxides. W. Simon, I. Asbury, V. E. Flanders. *U. S. Atomic Energy Commission,* AECD 2652, Aug. 27, 1948, 18 pages.

A procedure was developed which has a precision of 0.05% of the uranium present. Procedure differs from standard ones only in quality of equipment and in method of dissolving samples.

10C-167. The Use of Ether Extraction in the Determination of Uranium. T. R. Scott. *Analyst,* v. 74, Sept. 1949, p. 486-491.

An extraction procedure suitable for general application.

10C-168. The Determination of Zirconium in Minerals and Refractories by the Tannin Method. H. Holness and R. W. Kear. *Analyst,* v. 74, Sept. 1949, p. 505-507.

Modified procedure.

10C-169. Separation of Hafnium and Zirconium by a Fractional Distillational Procedure. D. N. Gruen and J. J. Katz. *U. S. Atomic Energy Commission,* AECD 2584, Mar. 29, 1949, 4 pages.

Procedure at atmospheric pressure using volatile complexes formed by reaction of Zr and $HfCl_4$ with $POCl_3$.

10C-170. Micro-séparation du manganèse par le réactif carbamique de Delépine. (Microseparation of Manganese by Means of Delepine's Carbamic Reagent.) Georges Sag. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. 30-31.

Simple, rapid and accurate method for elimination of Ce, Co, Cr, ferrous ions, and Ni during colorimetric determination of Mn in metals.

10C-171. Prispevek k identifikaci ruznych druhu tvrdych kovu. (A Contribution to the Identification of Various Kinds of Hard Metals.) Miroslav Petrdlík. *Hutnické Listy,* v. 4, June 1949, p. 165-168.

Use of colorimetric or electroanalytical methods for Ti and Co carbides

10C-172. Method of Determination of Cadmium in Low Concentrations. (In Russian.) Yu. A. Chernikhov and B. M. Dobkina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 906-909.

Contrary to the literature, Cd carbamate is soluble in organic solvents and possesses high stability in an aqueous medium. Possibility of quantitative extraction of Cd in carbamate form by an organic solvent from aqueous media of pH 1.5-9.0 is demonstrated. Final determination is performed by the dithizone method.

10C-173. Use of Solid Immersed Electrodes for Polarographic Determination of Silver. (In Russian.) Yu. S. Lyalikov and R. I. Glazer. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 909-911.

Tabulated and graphed data.

10C-174. Electrolytic Separation of Copper From Small Amounts of Cadmium. (In Russian.) P. N. Kovalenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 915-918.

Applying an oxidized aluminum cathode for electrolytic Cu determination and its separation from additions. Electrodeposition of large amounts of Cu is possible at pH's of 1.0-2.5 and temperatures of 20-80° C. Amount deposited depends on these

factors and also on character of surface treatment of the Al cathode.

10C-175. Spectrographic Analysis of Nickel Alloys. (In Russian.) K. A. Sykhenko and O. I. Mladentseva. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 946-950.

Methods for analyzing Ni alloys for Cr, Ti, Fe, Al, Cu, Si, and Mn. Applicability of different light sources. Influence of supporting-electrode material, size of spark gap, self-inductive capacity, and time of heating the electrodes. Best pairs of spectral lines for analysis are indicated.

10C-176. Water-Soluble 1,2-Dioximes as Analytical Reagents. Roger C. Voter and Charles V. Banks. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1320-1323.

Advantage over reagents for Ni and Pd such as dimethylglyoxime, which must be made up in organic solvents, where the danger of contamination of the Ni precipitate with excess reagent is always imminent. 25 ref.

10C-177. Precipitation of Thorium From Homogeneous Solution; Separation From Rare Earths of Monazite Sand With Tetrachlorophthalic Acid. Louis Gordon, C. H. Vanselow, and Hobart H. Willard. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1323-1325.

10C-178. Extraction of Cupferrates. N. Howell Furman, W. B. Mason, and Joseph S. Pekola. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1325-1330.

Extraction of cupferrates by chloroform was found to be an effective procedure for removing Fe, Ti, Mo, V, etc., prior to estimation of other substances. 50 ref.

10C-179. Spectrophotometric Study of Spot Tests. E. H. Winslow and H. A. Liebhafsky. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1338-1342.

The α-benzoin oxime test for copper and the identification of silver by the action of a photographic developer were studied spectrophotometrically in transmittance and reflectance. Results indicate the former type of measurement to be preferable for quantitative evaluation of spot tests.

10C-180. Colorimetric Determination of Boron Using 1,1-Dianthrimide. Gordon H. Ellis, Elizabeth Gates Zook, and Oskar Baudisch. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1345-1348.

Sixty organic compounds were tested qualitatively in concentrated H_2SO_4 for their suitability as either colorimetric or fluorometric reagents for boron. Further qualitative testing led to choice of 1-amino-4-hydroxyanthraquinone as a fluorescent and 1,1′-dianthrimide as a colorimetric reagent.

10C-181. Color Reaction of Beryllium With Alkannin and Naphthazarin; Spectrophotometric Studies. A. L. Underwood and W. F. Neuman. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1348-1352.

14 references.

10C-182. Effect of Constituent Materials Upon Spectrographic Measurement of Seven Impurity Elements. M. C. Bachelder. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1366-1369.

Inorganic powder samples weighing 350 micrograms were burned to completion in a d.c. arc and effects of constituent elements upon spectrographic measurement of Sn, V, Be, Cd, Co, Sb, and Mn were studied.

10C-183. Determination of Zinc Oxide as a Residual of Zinc Powder. E. W. Balis, L. B. Bronk, and H. A. Liebhafsky. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1373-1374.

Simple technique, which may be applicable in other cases. The powder was spread on a copper boat, covered, wrapped tightly in annealed copper foil, and heated in vacuum at 450° C. In this way, the Zn was completely removed and the zinc oxide could be brushed off and weighed.

10C-184. Spectrochemical Determination of Lanthanum in Praseodymium Metal. William M. Spicer and Waldemar T. Ziegler. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1422-1423.

10C-185. Colorimetric Determination of Aluminum in Manganese Bronzes. J. Carroll, I. Geld, and G. Norwitz. *American Foundryman,* v. 16, Nov. 1949, p. 43.

Details of procedure.

10C-186. The Determination of Chromium in Ferro-Chromium. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 307-310.

Committee report. Method based on ammonium persulfide oxidation with silver nitrate as catalyst, followed by titration with ferrous ammonium sulfate and standard potassium dichromate, using barium diphenylamine sulfonate as indicator.

10C-187. Direct Determination of Iron in Brass and Bronze. D. Goldberg. *Iron Age,* v. 164, Nov. 17, 1949, p. 95-96.

Colorimetric method which requires considerably less time than conventional chemical analysis and gives greater accuracy because of elimination of iron loss.

10C-188. Use of Complexones in Chemical Analysis. II. (Cerimetric Determination of Cobalt.) (In English.) R. Pribil and V. Malicky. *Collection of Czechoslovak Chemical Communications,* v. 14, no. 7, 1949, p. 413-426.

The properties of complexes of bi- and tri-valent cobalt with ethylene-diamine tetra-acetic acid. Both complexes form redox systems of relatively low normal potential, making possible oxidimetric determination of bivalent Co. A method of cerimetric determination was developed applicable even in presence of metals usually accompanying Co. How to eliminate interfering influence of Mn and Ni.

10C-189. Determination of Impurities in Electroplating Solutions. XV. Traces of Silver in Copper Plating Baths. Earl J. Serfass and P. Burkhead. *Plating,* v. 36, Dec. 1949, p. 1237-1239, 1242-1244.

Reviews the literature. Details of method decided upon. 19 ref.

10C-190. Determination of Uranium in Ores by Field Analysis. F. E. Senftle and C. McMahon. *Canadian Mining and Metallurgical Bulletin,* v. 42, Nov. 1949, p. 618-621.

Geiger-counter technique for rough quantitative analysis.

10C-191. Characteristics of Pulsed Arcs in Spectrochemical Analysis. Part I. Zinc Alloys. D. A. Sinclair. *Journal of the Optical Society of America,* v. 39, Nov. 1949, p. 958-966.

Variations of some spectrochemically significant properties of pulsed-arc discharges produced by a condensed-arc-source unit. Quantitative responses of sensitivities, line ratios, and electrode heating to changes in pulse form.

10C-192. Determination of Arsenic in Lead and Tin Alloys. Louis Silverman. *Iron Age,* v. 164, Dec. 15, 1949, p. 96-98.

Rapid colorimetric method which employs sodium hypophosphite as a selective reducing agent for arsenic chloride in strong acid solution.

10C-193. Réaction de fluorescence de la résorcine sans anhydride phtalique. Application à l'identification du zinc et du cadmium. (Fluorescence Reaction of Resorcinol Obtained Without Use of Phthalic Anhydride. Application to Identification of Zinc and Cadmium.) Georges Denigès. *Comptes Rendus* (France), v. 229, Oct. 17, 1949, p. 734-735.

The classical reaction of fluorescence of resorcinol is obtained by condensation with phthalic anhydride. New technique is based on the fact that the action of H_2SO_4 or H_3PO_4 on resorcinol produces marked fluorescence.

10D—Light Metals

10D-1. Spektralanalytische Untersuchung von Umschmelzaluminium auf Spuren von Cd, Ni, Pb and Sn. (Spectrographic Analysis of Scrap Aluminum for Traces of Cd, Ni, Pb, and Sn.) W. Seith. *Metall,* Apr. 1948, p. 117-118.

Procedure for determining Cd, Ni, Pb, and Sn in aluminum.

10D-2. Die Anwendung (leitproben-) freier Auswertungsverfahren bei quantitativen spektrochemischen Analysen unter besonderer Beruckichitigung der Untersuchung von Aluminium und dessen Legierungen. (Use of Evaluation Methods not Requiring Standards in Quantitative Spectrochemical Analysis, With Special Reference to the Study of Aluminum and Its Alloys.) H. Moritz. *Metall,* May 1948, p. 150-153.

Application of the two-line process to determination of Mg and Si in different Al alloys. Actual experiences show that, under suitable conditions, only one calibration curve for each element being analyzed is necessary.

10D-3. Contributo all 'analisi spetrografica quantitativa del calcio nell 'alluminio e nelle leghe eutettiche Al-Si. (Contribution to the Quantitative Spectrographic Determination of Calcium in Aluminum and in the Eutectic Alloy Al-Si.) T. Nucciari. *Alluminio,* v. 17, Sept.-Oct. 1948, p. 437-443.

Experimental data and optimum conditions. Results compared with those obtained by other methods.

10D-4. Rapid Identification of Wrought Aluminum Alloys. S. Witcoff and N. H. Simpson. *Modern Metals,* v. 4, Jan. 1949, p. 24-27.

Spot-test method developed by Consolidated Vultee.

10D-5. The Quantitative Spectrographic Analysis of Beryllium and its Compounds. A. Lee Smith and Velmer A. Fassel. *U. S. Atomic Energy Commission,* AECD-2100, June 22, 1948, 9 pages.

Method for the simultaneous quantitative spectrographic determination of Al, Ca, Cr, Fe, Mn, Mg and Si in beryllium and its compounds.

10D-6. The Simultaneous Determination of Nickel and Zinc in Secondary Aluminium Alloys by Means of the Polarograph. B. A. Scott. *Analyst,* v. 73, Nov. 1948, p. 613-615.

10D-7. Relacion entre las densidades

de ennegrecimiento de las lineas espectrales y el estado de las aleaciones de tipo Duraluminio. (Relation Between the Density of Spectral Lines and Behavior of Alloys of the Duralumin Type.) Juan Manual Lopez de Azcona and Antonio Camunas Puig. *Spectrochimica Acta,* v. 3, May 1, 1948, p. 206-213.

The density curves of Al, Cu, Mg, Mn, Fe and Si in duralumin-type alloys are shown to depend upon thermal treatment of the electrodes, during natural and artificial aging at temperatures from room almost to the melting points. Results show agreement with prevailing theories of thermal alterations of mixed crystals in alloys.

10D-8. Méthodes d'analyse de l'aluminium. Le dosage du manganese. Le dosage du zinc. Le dosage du titane. (Methods of Analysis of Aluminum. Determination of Manganese. Determination of Zinc. Determination of Titanium.) *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 358-360, 365; Dec. 1948, p. 375-376.

Several methods commonly used in France on an industrial scale. Nov. issue—manganese and zinc; Dec. issue—titanium.

10D-9. Extending the Range of the Spekker Absorptiometer, With Particular Reference to the Determination of Silicon in Aluminium Alloys. William Stross. *Metallurgia,* v. 39, Jan. 1949, p. 159-162.

The usual measuring range is limited to extinctions not exceeding 1.3. A technique by which this range can be doubled and its application to the determination of silicon.

10D-10. Lithium Color Reactions. (In Russian.) V. I. Kuznetsov. *Zhurnal Analiticheskoi Khimii* (Journal of Analytical Chemistry), v. 3, Sept.-Oct. 1948, p. 295-302.

A series of organic reagents which permit colorimetric determination of lithium in concentrations as low as 1:2,000,000. 18 ref.

10D-11. Studi polarografici applicati alla metallurgia dell'alluminio: determinazione del sodio nei fanghi rossi. (Polarography as Applied to Aluminum Metallurgy. Determination of Sodium in Red Mud.) G. Semerano and V. Capitanio. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 566-571.

A polarographic method for sodium is based on the solubility of Al_2O_3 in tetraethylammonium and on the possibility of electrodeposition of sodium from such a solution. Precision is ± 1%. 29 ref.

10D-12. Determination of Beryllium in Silicate Rocks. (In English.) E. B. Sandell. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 89-95.

An improved method for traces which can be applied to sub-silicic as well as silicic types. Beryllium is separated, together with Al, from Ca, Mg, Mn, and Fe, by ammonia precipitation in the presence of mercaptoacetic acid. The Be in the precipitate is brought into solution, and separated from Ti and small amounts of Fe, and possibly other coprecipitated metals, by double fusion with NaOH. The final determination is made fluorimetrically.

10D-13. The Determination of Aluminium by the Ammonium Benzoate Method. An Investigation Into Factors Affecting the Separation and Estimation of Aluminium and Beryllium. (In English.) G. H. Osborn and A. Jewsbury. *Analytica Chimica Acta,* v. 3, Jan. 1949, p. 108-112.

10D-14. Magnesiumbestimmung in Aluminiumlegierungen mittelst Hochvakuum. (A High-Vacuum Method for Determining Magnesium in Aluminum Alloys.) P. Urech, P. Muller, and R. Sulzberger. *Helvetica Chimica Acta,* v. 32, Mar. 15, 1949, p. 371-377.

The proposed new industrial-control method is based on the principle of high-vacuum distillation. Its range of accuracy is 0.01-0.02%, provided the alloy contains no other volatile metals. Method and apparatus. 11 ref.

10D-15. Studies on the Color Reaction of Beryllium With Alkanet Preparations. A. L. Underwood and W. F. Neuman. *U. S. Atomic Energy Commission,* AECD-1982, Apr. 9, 1948, 9 pages.

Colorimetric method for determination of small amounts of beryllium using a compound isolated from alkanet root. Effects of pH, concentration of reagent, time of standing, heating, and several common ions. Accuracy is quite satisfactory.

10D-16. Rappel et discussion des plus récentes méthodes pour le dosage rapide des éléments d'addition et des impuretés des alliages légers en vue d'assurer la constance de leur composition. (Review and discussion of the Most Recent Rapid Methods for Determination of Alloying Elements and Impurities in Light Alloys in Order to Assure the Constancy of Their Composition.) J. Navarro. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 8-12.

Rapid methods of determination of Cu, Mn, Mg, Fe, Si, Pb, Zn, Ni, Cr, and Ti in light alloys.

10D-17. Determination of Chromium in Aluminium Alloys Using a Photocolorimeter. (In Russian.) A. A. Tikhonova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 108-109.

Method and reagents.

10D-18. Influence of Additions on the Aluminum Spectrum. (In Russian.) G. I. Zhuravlev and V. P. Malyavkina. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 115-117.

The influence of additions of Mn, Mg, Fe, Si, Cu and Zn on the intensities of aluminum lines used as references during spectrographic analysis of Al alloys.

10D-19. Spectrographic Analysis of Aluminium Alloys During Excitation of the Spectrum by an Alternating-Current Arc With an Interruptor. (In Russian.) V. D. Mikhalevskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Jan. 1949, p. 117-119.

When applying a mechanical interruptor to an a.c. arc, accuracy of analysis was shown to be sufficient for rapid analysis of aluminum alloys.

10D-20. Dosage colorimétrique du manganese et du chrome. (Colorimetric Determination of Manganese and of Chromium.) S. Lacroix and M. Labalade. *Analytica Chimica Acta,* v. 3, Mar. 1949, p. 262-271.

Cr and Mn are oxidized by periodate and determined colorimetrically under well defined optical conditions. In simple cases Mn can be determined to about 0.3% and Cr to about 0.5%. The method was applied to determination in Al alloys and bauxites. 23 ref.

10D-21. The Use of Solochrome Cyanine as a Colorimetric Reagent for Beryllium With Special Reference to the Determination in Magnesium and Its Alloys. C. H. Wood and H. Isherwood. *Metallurgia,* v. 39, Apr. 1949, p. 321-323.

10D-22. Determination of Copper by Dithio-Oxamide in Magnesium and Magnesium Alloys. H. H. Willard, Robert E. Mosher, and A. J. Boyle. *Analytical Chemistry,* v. 21, May 1949, p. 598-599.

Rapid, accurate, and direct colorimetric procedure. The color reagent employed is rubeanic acid (dithiooxamide) in combination with a buffer complex composed of acetate and malonic acid.

10D-23. Magnesium; Rapid Alkalimetric Determination in Calcium and Magnesium Carbonate Ores. S. C. Sane and M. S. Telang. *Analytical Chemistry,* v. 21, May 1949, p. 618-620.

10D-24. Colorimetrische Bestimmung von Magnesium mittels Titangelb unter Entfernung störender Elemente wie Eisen, Aluminium und Mangan durch Ausschuttelung mit Acetylaceton. (Colorimetric Determination of Magnesium With Titanium Yellow by Removing Disturbing Elements Such as Iron, Aluminum, and Manganese Through Extraction With Acetylacetone.) E. Abrahamczik. *Angewandte Chemie,* v. 61, Mar. 1949, p. 96-98.

A review. 55 ref.

10D-25. Uber einen Nachweis von Magnesium mit Azofarbstoffen. (Detection of Magnesium by Means of Azo Dyes.) Hermann Rath and Alberto Sanchez. *Fresenius' Zeitschrift fur Analytische Chemie,* v. 129, no. 1, 1949, p. 1-3.

10D-26. Sampling Procedures in the Modern Die Casting Plant. James L. Erickson. *Light Metal Age,* v. 7, June 1949, p. 12-13, 20.

Recommended procedures for sampling Al and Mg in molten and ingot form prior to analysis.

10D-27. Betriebserfahrungen mit dem lichtelektrischen Kolorimeter von Dr. B. Lange. (Industrial Experiences With Dr. B. Lange's Photoelectric Colorimeter.) R. Bauer and J. Eisen. *Metall,* v. 3, June 1949, p. 187-189.

Use of the instrument as a rapid method for analyzing light alloys.

10D-28. Massanalytische Kupfer Schnellbestimmung im Duralumin. (Rapid Quantitative Determination of Copper in Duralumin.) F. Weste. *Archiv fur Metallkunde,* v. 2, Apr. 1949, p. 147-149.

The proposed method is based on reduction of the Cu in the Cu-tartaric acid complex followed by titration of the resulting $FeSO_4$.

10D-29. The Polarographic Analysis of Light Metals and Alloys: a Survey. W. Stross. *Analyst,* v. 74, May 1949, p. 285-292.

Alkali, alkaline-earth, and rare-earth metals; Mg, Al, and Be. 40 ref.

10D-30. The Quantitative Separation of Beryllium From Aluminium. W. C. Coppins. *Analyst,* v. 74, May 1949, p. 317-318; discussion p. 318.

When a caustic alkaline solution of Be and Al is neutralized with dilute acid, the $Be(OH)_2$ starts to precipitate first, and on subsequent boiling, precipitation of beryllia is quantitative while Al remains in solution. Indigo carmine may be used as indicator to show the correct alkalinity. With a large excess of Al double precipitation is necessary.

10D-31. A Rapid Method for Estimating the Hydrogen Content of Wrought Aluminium Alloys. A. J. Swain. *Journal of the Institute of Metals,* v. 75, July 1949, p. 863-868.

A quantitative correlation was found between the voids formed in specimens of 7% Mg Al-alloy sheet when immersed in molten potassium dichromate at 580° C. for 10 min., and the hydrogen content determined by the vacuum-extraction method. This forms the basis of a simple and rapid method for estimating the hydrogen content of the wrought alloy to an accuracy, in the range investigated, of approximately ±0.10 cc. in 100 g.

10D-32. Au sujet du dosage de l'alumine dans l'aluminium et ses alliages. (Determination of Alumina in Aluminum and Its Alloys.) M. Tournaire. *Revue de Métallurgie,* v. 46, May 1949, p. 294-296.

Comparatively analyzes three methods. The wet method is the simplest and will give good results if carefully performed.

10D-33. Spectrographic Determination of Impurities in Beryllium and Its Compounds. A. Lee Smith and Velmer A. Fassel. *Analytical Chemistry,* v. 21, Sept. 1949, p. 1095-1098.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2100. See item 10D-5, 1949.

10D-34. Die potentiometrische Schnellbestimmung von Mangan in Leichtmetall-Legierungen. (A Rapid Potentiometric Method for Determining the Manganese Content of Light-Metal Alloys.) G. Maassen. *Metall,* v. 3, Aug. 1949, p. 257-260.

Details of method and typical results.

10D-35. Schnellerkennung von Leichtmetall-Legierungen. (Rapid Analysis of Light-Metal Alloys.) M. Niessner. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 305-306.

Spot and filter tests and e.m.f. determination of composition.

10D-36. Über eine Methode der Bestimmung von Wasserstoff, insbesondere in Magnesium. (A Method of Determining Hydrogen, Especially in Magnesium.) Franz Sauerwald. *Zeitschrift für anorganische Chemie,* v. 256, May 1948, p. 217-225.

Chlorine is passed into the molten sample, the resulting HCl is burned with oxygen and over CuO, and the water thus formed is weighed. Control tests were made to determine the suitability of the method.

10D-37. Determination of Small Amounts of Iron in Metallic Magnesium. (In Russian.) I. V. Rozenberg. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Aug. 1949, p. 944-945.

Spectrochemical method for determining concentrations of 0.001-0.01% Fe in metallic Mg.

10D-38. Quantitative Study of Reaction Between Beryllium and Quinizarin-2-Sulfonic Acid. Myron W. Cucci, W. F. Neuman, and B. J. Mulryan. *Analytical Chemistry,* v. 21, Nov. 1949, p. 1358-1360.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-1990. See item 10C-107, 1949.

10D-39. (Book) **Modern Methods for the Analysis of Aluminium Alloys.** 144 pages. 1949. Chapman and Hall, Ltd., 37 Essex St., London, W.C. 2, England. 13s., 6d.

New methods, modified versions of those already known, and a few standard ones. Methods range from those requiring modern physicochemical instruments, such as the polarograph and photometer, to those which may be carried out with equipment available in the general chemical laboratory. Chapters on gravimetric and volumetric methods, electrolytic methods, and photopolarographic methods. An appendix deals with less common elements and with composite schemes of photometric analysis.

SECTION XI

APPARATUS, INSTRUMENTS and METHODS

11-1. A Method of Calibrating Extensometers. W. C. Aber and F. M. Howell. *ASTM Bulletin,* Dec. 1948, p. 33-35; discussion p. 35.

A simple method especially suited for verifying autographic extensometers. The degree of precision is such that the method appears to be entirely satisfactory for verifying strainometers used for determinations of yield strength. Comparison charts enable calibrations to be made very quickly.

11-2. Applications of Reaction Kinetics to Metallographic Problems. G. M. Schwab and G. Petroutsos. *Research,* v. 1, Dec. 1948, p. 717-718.

Previous papers from the authors' laboratory have described the catalytic action of Hume-Rothery alloys in dehydrogenation of formic acid, showing that activation energy of this reaction is related to electron concentration and lattice type. Additional results obtained with six binary alloy systems. Usefulness of the method for alloy research.

11-3. Metallographic Examination of Hot Metal Surfaces. *Iron Age,* v. 162, Dec. 16, 1948, p. 89. Based on article in *Iron and Coal Trades Review,* June 18, 1948.

Use of reflecting microscope. The instrument can be used for photography in both the visible and the ultraviolet regions.

11-4. The Interpretation and Application of Electron-Diffraction "Kikuchi-Line" Patterns. Part II. The Methods of Indexing the Patterns. H. Wilman. *Proceedings of the Physical Society,* v. 61, Nov. 1, 1948, p. 416-430.

Seven methods of indexing electron-diffraction Kikuchi-line patterns from single crystals for the purpose of practical use of such patterns. 11 ref.

11-5. A Technique for Quantitative Determination of Texture of Sheet Metals. John T. Norton. *Journal of Applied Physics,* v. 19, Dec. 1948, p. 1176-1178.

Method using an x-ray unit equipped with a Geiger-Muller counter for measuring intensities. Small rods are cut from the sheet with their axes parallel to the plane of the sheet and making various angles with the rolling direction. With the counter tube set at the correct diffraction angle for the desired crystallographic plane, each rod in turn is placed in the beam and rotated continuously about its axis. The recorder chart, synchronized with the rod rotation, plots a curve of intensity vs. angular position.

11-6. The Application of Electron Multiplier Tubes in the Measurement of X-Ray Beam Intensities and in the Determination of Crystal Structure. G. Papp and K. Sasvari. *Journal of Applied Physics,* v. 19, Dec. 1948, p. 1182-1183.

Outlines the above as developed in Hungary.

11-7. Determination of Surface Tension of Molten Materials; Adaptation of the Pendent Drop Method. James K. Davis and F. E. Bartell. *Analytical Chemistry,* v. 20, Dec. 1948, p. 1182-1185.

A simple and apparently accurate method for the determination of surface tension at elevated temperatures. Surface tension measurements on molten glass, resins, waxes, metals, and metallic oxides. 12 ref.

11-8. Precision Method of Thermal Analysis. R. M. Gruver. *Journal of the American Ceramic Society,* v. 31, Dec. 1, 1948, p. 323-328.

A continuously recording potentiometer, measuring accurately heat effects of from 0.1 to 500° C., is used to determine the differential temperature between a sample and a reference material. The temperature rise is controlled by a continuous voltage-adjustment-type program controller. The sample holder differs from usual ones in that it

has low heat capacity, high conductivity, and small mass. 10 ref.

11-9. Thermoelectric Method of Determining the Limit of Solubility of Manganese in Aluminum. (In Russian.) I. L. Rogel'berg and E. S. Shpichinetskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1216-1218.

The method, the apparatus used, and results obtained.

11-10. Analyses and Interpretations of X-Ray Diffraction Effects in Patterns of Aged Alloys. A. H. Geisler and J. K. Hill. *Acta Crystallographica,* v. 1, Nov. 1948, p. 238-252.

Limitations of the various X-ray diffraction methods used to study the structure of aged alloys. A method which employs a stationary single crystal and characteristic radiation is applied to the structures of aged Al-Ag and Al-Mg-Si alloys. Evidence for one- and two-dimensional diffraction is reported for both alloys. Limitation of particle dimensions is proposed as a general explanation of the diffraction effects. 19 ref.

11-11. X-Ray Spectrometer With Geiger Counter for Measuring Powder Diffraction Patterns. J. Bleeksma, G. Kloos, and H. J. Di Giovanni. *Philips Technical Review,* v. 10, July 1948, p. 1-12.

With the spectrometer described, X-ray diffraction patterns are traversed by a Geiger-counter tube detector instead of being recorded on photographic film. Accuracy and resolving power are better than with commonly used photographic methods, under comparable conditions. Additional advantages are claimed.

11-12. Controlled Grain Growth Applied to the Problem of Grain Boundary Energy Measurements. C. G. Dunn. *Journal of Metals,* v. 1, sec. 3, Jan. 1949, p. 72.

Extension of a successful method for growing single crystals of silicon ferrite to predetermined orientations in flat specimens, in which three-grain specimens are made in such a way that the equilibrium common grain boundaries are perpendicular to the surface of the specimen. The angles to be measured then appear as the grain-boundary angles in the surface of the specimen.

11-13. Three-Inch Experimental Cupola. *Pig Iron Rough Notes,* Autumn 1948, p. 18-19.

Fred C. Barbour and W. M. Spradlin of McWane Cast Iron Pipe Co., Birmingham, designed and built midget cupola to study the effect of the various elements in iron upon iron's ability to absorb carbon. It was found to operate in a manner comparable to a much larger cupola.

11-14. Optical Determination of Thin Films on Reflecting Bases in Transparent Environments. A. B. Winterbottom. *Journal of the Optical Society of America,* v. 38, Dec. 1948, p. 1074-1082.

The classical theory of metal and film optics and its implications in connection with various optical methods for studying films and surfaces. An experimental technique for determination of thin films *in situ* from the change produced in the reflection of a polarized wave. Examples of applications. 24 ref.

11-15. Applications of the Photographic Pressure Effect. K. B. Mather. *Journal of the Optical Society of America,* v. 38, Dec. 1948, p. 1065-1067.

Because of their sensitivity to mechanical pressure, photographic emulsions will reproduce accurately surface contours pressed against them. This offers a new method for preparing high-contrast transparent replicas for microscopy. The technique may be applicable to the microscopy of metallurgical and other opaque surfaces.

11-16. Production of Extremely Thin Metal Films by Evaporation on to Liquid Surfaces. Nils Hast. *Nature,* v. 162, Dec. 4, 1948, p. 892-893.

According to the technique described, Be and Al were evaporated onto a thin layer of glycerol on glass. It is thus possible to make films of 10-20A. in thickness, which can be supported on screens having as much as 80% open area. Value of such films in research.

11-17. Tricks With the Supersonic Reflectoscope. Floyd A. Firestone. *Non-Destructive Testing,* v. 7, Fall 1948, p. 5-19.

Unusual techniques include detecting flaws lying near the surface; increasing the strength of high-frequency waves with tinfoil under the crystal; measuring average grain size in metals; the ray-bender; testing of thin sheets; determining residual stress or incipient fatigue beneath a surface; generating shear waves or longitudinal waves by reflection; determining Poisson's ratio, Young's modulus, and the shearing modulus; measuring thickness of a part.

11-18. Technique de l'évaporation des

couches minces multiples. (Evaporation Technique for Deposition of Multiple Thin Layers.) Ch. Dufour. *Le Vide,* v. 3, July-Sept. 1948, p. 480-486.

Method for control of the thickness of layers obtained by vacuum evaporation. A process permitting deposition of layers of different substances and of different thicknesses is proposed.

11-19. An Examination of the Thiocyanate Porosity Test for Tinplate. J. Pearson and W. Bullough. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 376-380.

The above test was found to require modification. Suggestions are made with respect to preparation of test solutions, cleaning of the specimens, and estimation of dissolved iron. Results indicate that the modified method is suitable for quantitative estimation of the extent of discontinuities in the coating on commercial hot-dipped tinplate.

11-20. A Vacuum Furnace High-Temperature Microscopy. D. G. Nickols. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 415-416.

Vacuum furnace which permits metal specimens to be examined microscopically at temperatures up to 950° C. incorporates a mica observation window and gaskets of heat-resistant silicone rubber.

11-21 (Book). **Practical Spectroscopy.** George R. Harrison, Richard C. Lord, and John R. Loofbourow. 573 pages. 1948. Prentice-Hall, 70 Fifth Ave., New York 11, N. Y.

Attempts to give a comprehensive view of the status and possibilities of experimental spectroscopy as it exists today. References to specific points are given as footnotes; at the ends of most chapters appropriate general references are also given.

11-22. Determination of the Elastic Constants of Solids by Ultrasonic Methods. William C. Schneider and Charles J. Burton. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 48-58.

A rotating-plate technique in which ultrasonic transmission is plotted as a function of the angle of incidence of the waves allows determination of velocities of dilatation and shear waves. From these data, Poisson's ratio and mechanical moduli may be determined. Details of an apparatus for making such measurements. The elastic constants of several metals were measured. 10 ref.

11-23. A Method for Measuring the Total Power of Small-Angle X-Ray Scattering. B. E. Warren. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 96-97.

Techniques in common use are designed to measure the intensity of small-angle scattering in arbitrary units as a function of the angle of scattering. The method described gives the total power of small-angle scattering in absolute units, that is, the ratio of the total power per gram of scattering substance to intensity of the primary beam.

11-24. A Method for Studying the Forces Between Metals and Ionic Substances. Evelyn C. Marboe and W. A. Weyl. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 124.

Method is based on the fact that atomic gold adsorbed at the surface of a white solid has no visible light absorption. Metallic gold in relatively large crystals is yellow brown. However, when changing from the atomic subdivision to the crystalline aggregate, gold goes through a very highly colored stage, in which traces of this metal can be detected by its characteristic light absorption.

11-25. The Effect of "Multiple Grounds" on Electron Microscope Images. W. L. Grube. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 125.

Multiple grounds may cause double images, and when they are required, they should be made outside the microscope and only one lead brought into the cabinet.

11-26. New Type of Metallurgical Microscope. Tom Bishop. *Metal Progress,* v. 55, Jan. 1949, p. 60-61.

Instrument in which concave and convex mirrors replace conventional lenses. It can be used for photography in the ultraviolet region. An important metallurgical application is based on the long working distance. This has permitted photomicrographs to be taken at 500 diameters of metal surfaces at a bright red heat.

11-27. The Phase-Contrast Incident-Light Microscope. F. W. Cuckow. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 1-10.

Experiments in the comparative microscopy of metals lead to the conclusion that new information can be gained from a knowledge of the various levels existing in the surface of the prepared metallurgical specimen. Means available for study of these levels, and a new instrument. A comparative microscope in which a single field of view is divided into two parts, one of which is seen under phase-con-

trast conditions and the other under normal conditions. 23 ref.

11-28. Applications of the Plastic Replica Process to Surface Finish Measurement. C. Timms and C. A. Scoles. *Plastics* (London), v. 13, Jan. 1949, p. 24-28, 44.

Use of plastic impressions for measuring the degree of surface finish of large engineering components which are not readily accessible to the exploring probe of standard designs of surface-finish recording instruments. The process consists in taking a plastic replica, the impression thus obtained being measured directly by means of a stylus recording instrument. Typical recorder charts.

11-29. A Note on the Use of X-Ray Counter-Spectrometers for Single-Crystal Measurements. W. A. Wooster, G. N. Ramachandran, and A. Lang. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 405-407.

The above method was compared with an X-ray photographic method as a means of determining the integrated reflection of a number of reflections. Advantages and limitations of photographic, ionization, and counter-spectrometers.

11-30. An X-Ray Tube With Adjustable Focus. U. W. Arndt. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 414-416.

An experimental cathode assembly, designed to be fitted to the standard target head of a Crystallographic X-ray Unit, which makes it possible to obtain an adjustable focus 1 cm. in length and down to 1/3 mm. in height, without a surrounding halo. Stability of the tube current.

11-31. The Preparation of Titanium and Vanadium X-Ray Targets. Alan D. McQuillan. *Journal of Scientific Instruments and of Physics in Industry,* v. 25, Dec. 1948, p. 423.

11-32. Reproduction of Radiographs; Method of Producing Contact Prints in Correct Tone. D. F. B. Tedds and E. D. Priday. *Metal Industry,* v. 74, Jan. 7, 1949, p. 12-13.

A novel and original method of producing contact prints and slides by use of a glass transparency. Methods of producing the glass transparency, reducing large X-ray photographs, and preparing the facsimile negative.

11-33. Finsiktningsundersökningar. (Fine-Screening Investigations.) II. Sture Mörtsell and P. V. Villner. *Jernkontorets Annaler,* v. 132, No. 11, 1948, p. 459-466.

Three different vibrating screens, each with an area of 0.5-0.7 sq. m., were compared, showing that one screen gives results of superior quality to the others. If only quantity is considered, one of the other screens seems to be the best. For screening through 0.20 mm. mesh, vibration of about 1 mm. seems to be most suitable. The effect of dilution was also found to be important.

11-34. Application of Ultrasonics to Technology and Physics. (In Russian.) S. Ya. Sokolov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1328-1335.

Application for determination of metal structures, detection of defects, determination of casehardening thicknesses, etc.

11-35. Simultaneous Measurement of the Optical Constants of Metals Over a Wide Wave-Length Range. J. Bor and B. G. Chapman. *Nature,* v. 163, Jan. 29, 1949, p. 183-184.

Experimental system; pattern obtained for aluminum. The time involved in the new method is much shorter than other methods, which require use of monochromatic light.

11-36. X-Ray Camera for Precision Measurements of Crystals. (In Russian.) M. M. Umanskii, S. S. Kvitka, and Yu. A. Bagaryatskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1343-1350.

A special camera for precision measurement of monocrystalline lattices. Advantages for this apparatus as compared to those commonly used.

11-37. Film Adapter for Microscopes. (In Russian.) A. A. Dyatlov and A. I. Berkhoshapov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1397-1399.

Existing adapters are said to be designed primarily for biological work, hence awkward for metallography. Adapter more suitable for such work.

11-38. Selection of Material for the Pole Pieces of an Electron Microscope. (In Russian.) Sh. M. Rakhimov and N. G. Sushkin. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1166-1172.

The influence of pole pieces of different materials on the refractive power of the magnetic objective lens and distribution of the magnetic field along the axis of the lens was investigated. Experimental results which confirm the Glaser formula.

11-39. Die Verwendung von galvanischen Elementen zur Messung des in Wasser gelosten Sauerstoffes und zur Korrosionsanzeige. (Using Voltaic Cells for Measuring the Amount of Oxygen Dissolved in Water and for Indicating Corrosion.) F. Todt. *Archiv fur Metallkunde,* v. 1, Nov.-Dec. 1947, p. 469-471.

Method claimed to have important advantages over Winkler's chemical method, especially in the control of waste water and in the observation of biological and oxygen-consuming reactions in water. It can also be used for testing paint and other protective coatings on metals. 14 ref.

11-40. Debye-Scherrer-Aufnahmen an Pulverplättchen. (Debye-Scherrer Recordings on Small Powder Plates.) Georg Menzer. *Zeitschrift fur Naturforschung,* v. 2a, June 1947, p. 335-343.

Disadvantages of the bar method; absorption factors of the plate method as well as its advantages and disadvantages. 11 ref.

11-41. A Vacuum Dilatometer for Routine Metallurgical Investigations. T. Land and B. Sugarman. *Metallurgia,* v. 39, Jan. 1949, p. 126-128.

Apparatus permits an over-all accuracy in thermal expansion coefficients of 1×10^{-7} per °C., and utilizes a 3-in. rod-shaped specimen. Expansion is transmitted to a dial gage previously calibrated by means of a silica rod. Transformation temperatures are indicated to within about 2° C., and the apparatus is capable of operation up to 1000° C.

11-42. Surface Reflectometer for Evaluating Polished Surfaces. E. A. Ollard. *Journal of the Electrodepositors' Technical Society,* v. 24, 1948, p. 1-8. (Reprint.)

Instrument for evaluating the polish on a flat metal surface by a single reading. It will give a quantitative comparison of different surfaces in line with the results of visual examination. Suitability for electropolished surfaces.

11-43. An Improved X-Ray Diffraction Camera. W. Parrish and E. Cisney. *Philips Technical Review,* v. 10, Dec. 1948, p. 157-167.

Improved Debye-Scherrer camera produced by North American Philips Co. Various design factors.

11-44. Thickness of Composite Copper-Nickel Coatings Measured by Nondestructive Magnetic Method. *Steel,* v. 124, Feb. 7, 1949, p. 96.

Method developed by National Bureau of Standards involves measurement of attractive force between the plated specimen and two permanent magnets of different strengths.

11-45. High Temperature X-Ray Diffraction Techniques. J. J. Lander. *Review of Scientific Instruments,* v. 20, Jan. 1949, p. 82-83.

Three types of accessories for X-ray studies of materials at high temperatures. Two of them are suitable for the study of materials in high vacua or controlled atmospheres, and the third may be adapted for high vacuum but has been used with controlled atmospheres.

11-46. Microscopy of High-Temperature Phenomena. *Industrial Heating.* v. 16, Jan. 1949, p. 122, 124. A condensation based on paper by Henry N. Baumann, Jr.

New optical system in which the object being studied is several inches away from the lenses, thus making possible microscopic study of bodies too hot to be examined by conventional methods. This system has also been applied to motion-picture photomicrography, so that changes occurring at high temperatures can be observed directly.

11-47. Radio-Frequency Mass Spectrometry—A Promising New Analytical Method. Willard H. Bennett. *Instruments,* v. 22, Jan. 1949, p. 38-39.

Methods and equipment.

11-48. Influence of Shape on the Resistance of Bismuth Monocrystals in Magnetic Fields. (In Russian.) E. S. Borovik and B. G. Lazarev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 611-614.

Specially developed apparatus and technique was used in determination of the influence of the shape of the specimen on the form of the rotation diagram during measurement of resistance in a transverse magnetic field.

11-49. Electron-Microscope Investigation of Steel Structure. (In Russian.) N. N. Buinov and R. M. Lerinman. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 629-632.

Replica technique using a colloidal film. Composition of the colloidal substance and type of etchant.

11-50. Mesure, par les rayons X, de l'épaisseur des films minces déposés sur supports microcristallins. (Determination of Thickness of Thin Films Deposited on Crystalline Surfaces.) Charles Legrand. *Comptes Rendus*

(France), v. 227, Oct. 27, 1948, p. 831-833.

An X-ray diffraction method for the above, particularly for coated metal surfaces. Theoretical bases and sphere of application of the method.

11-51. Sur la réalisation et l'utilisation de faisceaux de rayons X tres fins, de l'ordre de quelques microns. (Production and Utilization of Very Thin Bundles of X-Rays of the Order of a Few Microns in Thickness.) Fernand Fournier. *Comptes Rendus* (France), v. 227, Oct. 27, 1948, p. 833-834.

Applicability for determination of crystal boundaries and microinclusions in alloys.

11-52. Photo-Density Method of Determining the Relative Penetration of Diffused Sodium 24 Tracer into Glass. James R. Johnson. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 129-131.

Compared with a thin-section analysis method. It is believed applicable to similar tracer problems such as metal-diffusion studies.

11-53. The Measurement of Forces Resisting Armor Penetration. A. Victor Masket. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 132-140.

Experimental and theoretical status of the optical chronograph. The instrument, together with a simple procedure for analysis of data, is capable of yielding the position, velocity, and deceleration of a nonplastically deforming small-arms projectile during the armor penetration process, which lasts 30 to 150 microsec. The precision of the derived decelerations is sufficient to permit evaluation of strain-rate and inertia effects during high-speed indentation by means of conical indenters at strain-rates approaching 2×10^5 per sec.

11-54. Density and Packing in an Aggregate of Mixed Spheres. Douglas Rennie Hudson. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 154-162.

Packing of unequal spheres is important in handling industrial substances such as nickel shot, coal, and iron ore. Less directly, the question is of importance in industrial sieving and grading, ore dressing, concrete technology, and soil physics, and in all processes of grinding by attrition. Mathematical analysis of the types of packing which exist and application to commercial materials. 11 ref.

11-55. Particle Size Determination by Soft X-Ray Scattering. K. L. Yudowitch. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 174-182.

Small angle X-ray scattering measurements are made on samples of colloidal gold of radius 50 to 400 angstroms. The usual method of analysis is shown to be valid only for particles of radius less than 120 wave-lengths. Extension of the method to larger particles is achieved, giving improved electron-microscope correlation. Use of longer wavelengths and optimum shaped slits is shown to reduce geometry errors sufficiently to give clear evidence of predicted intensity maxima. 24 ref.

11-56. A Positive-Replica Technique for Electron Microscopy. C. M. Schwartz, A. E. Austin, and P. M. Weber. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 202-205.

Technique which reproduces the contour variations of the specimen surface, and permits direct visual interpretation of elevation. The method utilizes two resins, each mutually insoluble in the solvent for the other, specifically, polyvinyl alcohol plus Formvar. Application to wear-test specimens.

11-57. Small Spherical Particles of Exceptionally Uniform Size. Robert C. Backus and Robley C. Williams. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 224-225.

Discovered in polystyrene latex during electron-microscope work. Three applications of the particles in electron microscopy, based on their uniform size.

11-58. Grain Growth in Octachloropropane. W. C. McCrone and P. T. Cheng. **Comments on "Grain Growth in Octochloropropane".** Paul A. Beck. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 230-231.

Octachloropropane can be used to study grain growth in metals because of its analogous behavior. Advantages over use of the metals themselves are lower temperature range, transparent specimens, and simpler techniques. The isothermal grain-growth relationship for pure metal and certain pure solid solutions.

11-59. Comments on "Electronic Radiography and Microradiography". Herman E. Seemann. *Journal of Applied Physics,* v. 20, Feb. 1949, p. 231-232.

A few suggestions regarding technique described by J. Trillat in above paper (see item 11-224, 1948).

11-60. Measuring Wing-Surface Smoothness: a Method of Obtaining Photographic Records Over Continuous Profiles. E. R. Arbon, R. H. Blyth,

and L. C. M. Daniels. *Aircraft Production*, v. 11, Feb. 1949, p. 39-43.

Apparatus and procedure for the above. The equipment includes camera, oscilloscope, amplifier, exploring "mouse" and calibrating unit.

11-61. The Preparation of Single Crystals for the Study of Surface Reactions. Allan T. Gwathmey. "Pittsburgh International Conference on Surface Reactions", p. 66-70.

Method and certain conclusions concerning the nature of a metal surface during reaction. Special emphasis is placed on the relationship between the apparent geometric surface and the crystal planes within the metal.

11-62. Studies of Metal Surfaces by Low Temperature Gas Adsorption. Paul H. Emmett. "Pittsburgh International Conference on Surface Reactions", p. 82-90.

By measuring low-temperature adsorption isotherms of suitable inert gases near their boiling points, it it possible to obtain reliable estimates of absolute surface areas. By appropriate choice of adsorbate, it is possible to measure surfaces as small as 100 sq. cm. with a reproducibility of perhaps 10%. Metal catalysts were studied extensively by this method. 17 ref.

11-63. Optical Determination of Thin Films on Reflecting Bases in Transparent Environments. A. B. Winterbottom. "Pittsburgh International Conference on Surface Reactions", p. 91-100.

Previously abstracted from *Journal of the Optical Society of America*. See item 11-14, 1949.

11-64. The Trapping of Electrons in Silver Chloride. J. R. Haynes and W. Shockley. "Report of a Conference on Strength of Solids," *The Physical Society*, 1948, p. 151-157.

Role of electrons in certain photographic processes. New techniques developed for the study of motion and trapping of electrons in crystals. A large number of electron traps are produced in the slip bands of deformed crystals.

11-65. Etude micrographique de l'oxydation du fer et des transformations du protoxyde de fer. (Micrographic Study of the Oxidation of Iron and of the Transformations of Ferrous Oxide.) Georges Chaudron. "Pittsburgh International Conference on Surface Reactions", 1948, p. 165-167.

Simple micrographic technique will give very precise information concerning these reaction mechanisms.

11-66. Detection of Ferrite by its Magnetism. T. V. Simpkinson and M. J. Lavigne. *Metal Progress*, v. 55, Feb. 1949, p. 164-167.

Many of the obscure troubles now and then experienced by stainless steels of the 18-8 family are ascribed to changes in microstructure. Detection of ferrite in duplex structures is difficult and likely to be erroneous if only the microscope is used. Measurement of residual magnetism is a sensitive detector of ferrite; although, when sigma phase co-exists, the magnetic and microscopic estimate may differ considerably.

11-67. Rapid Polish With Diamond Hand Hone. L. P. Tarasov and C. O. Lundberg. *Metal Progress*, v. 55, Feb. 1949, p. 183-184.

The intermediate stages in the polishing of metallographic specimens may be greatly speeded up by the use of a vitrified-bonded diamond hand hone. Technique can be used to polish high speed steels of the high-carbon, high-vanadium type which are difficult or impossible to polish by ordinary methods.

11-68. A Method of Examination of Sections of Fine Metal Powder Particles With the Electron Microscope. Laurence Delisle. *Journal of Metals*, v. 1, sec. 3, Mar. 1949, p. 228-232.

Application of a technique to the study of sections of metal-powder particles, less than 20 microns in diam., with the electron microscope using as replica a material such as formvar or parlodion.

11-69. Mounting Metallographic Specimens at Room Temperature. Herbert S. Kalish. *Iron Age*, v. 163, Mar. 10, 1949, p. 109.

Technique developed for examining low-melting-point metals or alloys, soft metals, metals which recrystallize at low temperatures, and alloys which age harden at room temperature or change structurally at temperatures slightly above room temperature. Polystyrene is the material used.

11-70. An Apparatus for the Production of Large Metallic Crystals by Solidification at High Temperatures. Louis Gold. *Review of Scientific Instruments*, v. 20, Feb. 1949, p. 115-121.

Design and operational aspects. Various high-temperature difficulties. 26 ref.

11-71. The Use of Addition Agents in Etchants for Special Effects. I. R. Lamborn. *Steel Processing*, v. 35, Feb. 1949, p. 86-88; discussion, p. 88-89.

A survey.

11-72. The X-Ray Microscope. Paul Kirkpatrick. *Scientific American*, v. 180, Mar. 1949, p. 44-47.

Such a microscope does not exist, but its fundamental problem has been solved. When a practical model has been built, some doors closed to electrons and light will be opened.

11-73. Crystal Setting by X-Rays. J. W. Jeffery. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Feb. 1949, p. 42-43.

Practical steps of an X-ray setting method which can be used to calculate goniometer arc adjustments for a crystal which fails to give a recognizable zero-layer curve when misset.

11-74. Porosity in Metal Coatings. Formation and Assessment: Note on Work in Progress at B.I.S.R.A. J. Pearson. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 102-106.

Causes of porosity, pore-counting methods, methods for determining pore area, and relationship of pore count to weight of tinplate coatings. A new method for determination of porosity by cathodic suppression of solution.

11-75. A Third Graphical Method of Indexing Powder Photographs of Long-Spacing Compounds. (In English.) Vladimir Vand. *Acta Crystallographica,* v. 1, Dec. 1948, p. 290-291.

Method suitable for compounds with identifiable long-spacing reflections.

11-76. Secondary Extinction and Neutron Crystallography. (In English.) G. E. Bacon and R. D. Lowde. *Acta Crystallographica,* v. 1, Dec. 1948, p. 303-314.

Effects of secondary extinction with particular stress on the behavior of the virtually non-absorbing crystals introduced by neutron diffraction. Penetration of a beam into crystal of this kind will always be complete, and the relative importance of absorption and extinction is the reverse of that familiar in X-ray techniques. Criteria for "thin," "thick", "non-absorbing" and "absorbing" crystals are given.

11-77. The Measurement of Small Differences Between Lattice Spacings of Two Solid Solutions. (In English.) E. G. Steward. *Acta Crystallographica,* v. 1, Dec. 1948, p. 339.

Modified technique.

11-78. Calculation of the Magnetic Skin Effect in Sheet Steel With Respect to the Relationship of Magnetic Permeability to Voltage of the Magnetic Field. (In Russian.) S. D. Margolin. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Oct. 1948, p. 1306-1316.

A method for sufficiently accurate determination of the distribution of voltage of the magnetic field and magnetic induction through the thickness of a sheet, located in an alternating field, taking into consideration the skin effect and the relationship of magnetic permeability and voltage of the magnetic field.

11-79. A High Temperature Precision X-Ray Camera. Some Measurements of the Thermal Coefficients of Expansion of Beryllium. Paul Gordon. *U. S. Atomic Energy Commission,* AECD-2426, Oct. 1, 1948, 15 pages.

Modification of the back-reflection symmetrical focusing type of camera. Specimen and furnace are within a vacuum chamber. Lattice parameters of beryllium were measured up to 1000° C. Derived coefficients of thermal expansion, both linear and bulk, are presented as a function of temperature. The data present strong evidence that the hexagonal close-packed form of Be which exists at room temperature is stable up to at least 1000° C., contrary to several reports in the literature.

11-80. Sur la détermination expérimentale de la perte spécifique d'énergie des corps solides par la méthode des pendules couplés. (Experimental Determination of the Loss of Specific Energy of Solids by the Method of Coupled Pendulums.) André Kovacs. *Comptes Rendus* (France), v. 227, Nov. 15, 1948, p. 1019-1020.

Formulas for the calculation. Advantages, from viewpoint of simplicity and accuracy.

11-81. Nouveau Microscope polarisant fonctionnant en lumiere convergente jusqu'a la température de −150 environ. (A New Polarizing Microscope Operating With Convergent Light at Temperatures as Low as −150° C.) Léon Bouttier. *Comptes Rendus* (France), v. 227, Nov. 22, 1948, p. 1084-1086.

The principal difference from the usual metallographic microscope consists of use of a refrigerating unit.

11-82. La structure et l'oxydation des surfaces d'aluminium polies électrolytiquement. (Structure and Oxidation of Electropolished Aluminum Surfaces.) Heinz Raether. *Comptes Rendus* (France), v. 227, Dec. 8, 1948, p. 1247-1249.

Aluminum specimens polished by Jacquet's method (perchloric acid—acetic anhydride) were investigated. Results demonstrate that the electrolytic bath removes only the aluminum without changing the microgeometry of the surface and its atomic dimensions.

11-83. Le microscope électronique et son emploi pour l'étude des états de surfaces. (The Electron Microscope and Its Use for Study of Surface Conditions.) Gaston Dupouy. *Journées des Etats de Surface,* 1946, p. 15-32.

See abstract from *Metal Treatment.* Item 11-110, 1946.

11-84. Etude des surfaces métalliques par voie électrolytique. Role de la couche de Beilby. (Study of Metallic Surfaces by an Electrolytic Method. Role of the Beilby Layer.) M. A. Grumbach. *Journées des Etats de Surface,* 1946, p. 37-39.

Reviews the above from 1912 to date.

11-85. L'oxydation anodique envisagée comme moyen d'étude de l'état de surface de l'aluminium et de ses alliages. (Anodic Oxidation As a Means of Studying the Surface State of Aluminum and Its Alloys.) P. Lacombe and L. Beaujard. *Journées des Etats de Surface,* 1946, p. 44-51; discussion, p. 51.

See abstract from *Metal Treatment,* item 11-20, 1946.

11-86. L'écrouissage superficiel de l'Aluminium et du Fer, par abrasion. Emploi des rayons X en retour pour l'étude des états de surface. (Superficial Strain Hardening of Aluminum and Iron by Means of Abrasion. Application of X-Ray Diffraction for the Study of Surface States.) J. Benard, S. P. Lacombe, and G. Chaudron. *Journées des Etats de Surface,* 1946, p. 73-80; discussion, p. 81.

A method for inspection of hardened surfaces by means of X-ray diffraction. Optimum conditions of investigation and a series of x-ray diagrams.

11-87. Quelques problemes relatifs a la conception des instruments pour l'étude des surfaces. (Some Problems Relative to the Development of Instruments for the Study of Surfaces.) R. E. Reason. *Journées des Etats de Surface,* 1946, p. 100-103; discussion, p. 103.

See abstract from *Institution of Mechanical Engineers, Proceedings,* item 11-50, 1946.

11-88. Généralités sur les méthodes optiques d'examen des surfaces. Méthodes mises en oeuvre a l'institut d'optique. (General Discussion of Optical Methods for Examination of Surfaces. Methods Used in the Optical Institute of France.) M. A. Arnulf. *Journées des Etats de Surface,* 1946, p. 104-109.

Various pieces of equipment.

11-89. Détermination des profils de rugosité par les méthodes de pointes longitudinaux et par interférences. (Determination of Surface Roughness by Use of Longitudinal Feelers and by Interference Techniques.) F. Flamant and M. A. Arnulf. *Journées des Etats de Surface,* 1946, p. 110-116; discussion, p. 116.

Application of individual methods to different surfaces, after simple machining, grinding, mechanical or electrolytic polishing.

11-90. Vue d'ensemble sur les récents travaux concernant la mesure de la rugosité des surfaces. (Survey of Recent Work on Measurement of Surface Roughness.) C. Timms. *Journées des Etats de Surface,* 1946, p. 117-123.

See abstract from *Metal Treatment,* item 11-55, 1946.

11-91. Comparaison des principales méthodes de controle microgéométrique. (Comparison of the Most Important Methods for Surface-Finish Control.) G. Michalet. *Journées des Etats de Surface,* 1946, p. 124-134; discussion, p. 134.

Different methods and equipment used for the determination of the roughness of surface and degree of polishing. Schematic drawings of equipment; methods of their application. 17 ref.

11-92. Suggestions concernant l'emploi du correlogramme pour l'interprétation des enregistrements du fini de surface. (Suggestions Concerning Use of Correlation Charts for Interpretation of Surface-Finish Records.) J. R. Womersley and M. R. Hopkins. *Journées des Etats de Surface,* 1946, p. 135-139; discussion, p. 139.

The profilogram obtained by an apparatus with feelers does not define completely the condition of the surface. The true surface condition may be determined only by meticulous analysis of a series of profilograms compiled into a correlation chart.

11-93. Etude optique de l'état de surfaces sablées et création de tests. (Optical Study of the Condition of Sand-Blasted Surfaces and the Methods for Their Testing.) F. Canac. *Journées des Etats de Surface,* 1946, p. 149-152; discussion, p. 152.

Test apparatus is described and method of interpretation of the results.

11-94. Relation entre le coefficient de frottement et l'état de surface. (Relation Between the Coefficient of Friction and Surface Conditions.) A. Marcelin. *Journées des Etats de Surface,* 1946, p. 179-184; discussion, p. 185-186

A newly developed apparatus called the "frictionograph". Method of application and interpretation of obtained data.

11-95. Etude de l'état de surface chimique de l'Aluminium par la mesure du potentiel de dissolution. (Study of the Chemical State of an Aluminum Surface by Measurement of Solution Potential.) P. Morize, P. Lacombe, and G. Chaudron. *Journées des Etats de Surface,* 1946, p. 242-246; discussion, p. 246.

Previously abstracted from translation in *British Chemical Digest.* See item 11-159, 1947.

11-96. Fractographic Examination of Ship Plate. C. A. Zapffe, C. O. Worden, and F. K. Landgraf. *Welding Journal,* v. 28, Mar. 1949, p. 126s-135s.

Application to the problem of classifying ship steels in terms of toughness and transition temperatures. Excellent agreement of predictions of fractography with mechanical testing. Effects of alloying elements, hydrogen, and heat treatments. 13 ref.

11-97. A Rapid Method for Preparing Powder Camera Specimens With Cellulose Acetate Capillary Tubes. Karl E. Beu and Howard H. Claassen. *Review of Scientific Instruments,* v. 19, Mar. 1948, p. 179-180.

Details which facilitate the synthesis of such tubes and their subsequent removal from the pilot wire. Wires of 22-gage copper, after annealing in an atmosphere of helium, are cleaned and dipped into the cellulose acetate solution by means of a crank-driven rack. The rate of withdrawal determines the wall thickness. A method for centering the filled specimen tubes precisely in the powder camera.

11-98. Un nuovo apparecchio generatore di raggi-X di grande lunghezza d'onda, per usi metallurgici. (A New Long-Wave-Length X-Ray Apparatus for Metallurgical Research.) A. Gilardoni. *Alluminio,* v. 17, Nov.-Dec. 1948, p. 576-580.

Describes apparatus with wave lengths of 0.6-0.17A, particularly adaptable for industrial research, construction and specifications.

11-99. Contemporary Feeler Equipment for Quantitative Determination of Surface Roughness. (In Russian.) P. E. D'yachenko. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1627-1633.

Existing methods and apparatus. Comparative results.

11-100. The Preparation of Thin Steel Specimens by Cutting; and the Isolation of Non-Metallic Inclusions *in Situ* by a Simplified Chemical Method. Carl Benedicks and Olof Tenow. *Journal of the Iron and Steel Institute,* v. 161, Mar. 1949, p. 177-186.

A method of preparing, by means of a microtome, thin steel specimens down to 20μ in thickness; development of the method. These specimens were used for the isolation of nonmetallic inclusions in steel and have shown the abundant occurrence, in AlN-rich steel, of thin, adsorbed films. 27 ref.

11-101. Nucleonics and Analytical Chemistry Symposium. *Analytical Chemistry,* v. 21, Mar. 15, 1949, p. 318-368.

Consists of following papers: "Radioactive Isotopes as Tracers," Peter E. Yankwich; "Radiochemical Activity Analysis," David N. Hume; "Determination of Naturally Occurring Radioactive Elements," Clement J. Rodden· "Method of Activation Analysis," G. E. Boyd; "Instruments for Measuring Radioactivity," C. J. Borkowski; "Measurement Techniques of Applied Radiochemistry," Truman P. Kohman; "Industrial Applications of Radionuclides," John W. Irvine, Jr. 347 ref.

11-102. Modified Silica Replica Technique. J. J. Comer and F. A. Hamm. *Analytical Chemistry,* v. 21, Mar. 15, 1949, p. 418-419.

Improved replica technique for electron microscopy.

11-103. An Electrical Pressure Meter for the Measurement of Open-Hearth-Furnace Differential Pressures. S. S. Carlisle and B. O. Smith. *Journal of the Iron and Steel Institute,* v. 161, Mar. 1949, p. 222-229.

A sensitive meter developed by the British Iron and Steel Research Association. It can be installed close to the measuring point on the roof of the furnace; thus, errors due to long pressure pipes are eliminated. It is specifically designed for remote indication.

11-104. Information Obtained From the Interaction of Slow Neutrons With Matter. James Rainwater. *Transactions of the New York Academy of Sciences,* ser. 2, v. 11, Jan. 1949, p. 72-80.

The slow neutron has been found to be an excellent tool for study of the atomic and nuclear properties of matter. Some of the information which can be obtained from such studies.

11-105. Determination of Absolute Intensities of X-Ray Reflexions From Relative Intensity Data. S. H. Yu. *Nature,* v. 163, Mar. 5, 1949, p. 375-376.

In 1942 the author proposed a simple method for determination of

absolute from relative intensities, which has since been made rigorous. Details of practical application.

11-106. A Correction to the Diameter Measurement of Diffuse X-Ray Diffraction Rings. L. G. Finch. *Nature,* v. 163, Mar. 12, 1949, p. 402-403.

Lattice parameter measurements of cold worked metals are subject to appreciable error if no provision is made for the lack of coincidence between the $K_{\alpha 1}$ peak and the apparent peak, as measured, of the broadened doublet. Describes correction method.

11-107. A Unit-Magnification Optical System With Long Working Distance for Microscopical Applications. J. Dyson. *Nature,* v. 163, Mar. 12, 1949, p. 400.

Applicable to microscopy of hot metallurgical specimens inside a vacuum furnace, examination of electrode conditions inside a vacuum tube, and examination of nuclear plates which may involve working through considerable thicknesses of glass and emulsion.

11-108. Subtraction of Atom Images From a Fourier Synthesis of a Crystal Lattice. (In English.) Chr. Finbak and N. Norman. *Acta Chemica Scandinavica,* v. 2, No. 9, 1948, p. 813-827.

How the images of the different atoms may be removed from the density function determined by two-dimensional Fourier synthesis of a crystal lattice. 16 ref.

11-109. Tastgerät fur Drahtziehsteine. (A Micro-Instrument for Testing Wire-Drawing Dies.) Hans Mucke. *Stahl und Eisen,* v. 68, Dec. 2, 1948, p. 484.

An instrument for examining the diameters and shapes of wire-drawing dies.

11-110. Rontgenmikroskopische Untersuchung an Leicht-metall-Legierungen. (Microradiographic Investigation of Light-Metal Alloys.) Eugen Osswald. *Zeitschrift fur Metallkunde,* v. 40, Jan. 1949, p. 12-15.

Compared with ordinary microscopic methods. The geometric form of the matrix crystal and its inclusions give information about the formation of the phases of metallic systems.

11-111. Rontgenaufnahmen an Blechen dunner Wandstärke. (X-Ray Investigation of Thin Sheet Metals.) Rudolf Lindemann. *Zeitschrift fur Metallkunde,* v. 40, Jan. 1949, p. 36-40.

Experiments to establish optimum voltages for the above. 10 ref.

11-112. Metallographic Technique for Steel; Polishing. *Metal Progress,* v. 55, Mar. 1949, p. 344B.

Typical micrographs illustrative of under-water and dry cutting; prevention of seepage in clamp mounts; preservation of inclusions; disturbed metal and its elimination; and steps in polishing—lead lap method.

11-113. A Study of Metallic Electrodes Prepared by Sublimation. B. C. Bradshaw. *Journal of Chemical Physics,* v. 17, Mar. 1949, p. 344.

Pure zinc metal was vacuum-sublimed on platinum wire set in the end of glass tubes. The electrodes, thus prepared, were placed in a dilute solution of pure $ZnCl_2$ saturated with basic zinc carbonate, air being rigidly excluded. Results so far obtained indicate that electrodes prepared in this way are free from strain and are reversible. It is hoped that this may be a general property of crystals formed in this way.

11-114. Infra-Red Absorption Analysis. 8. Principles, Application, and Technique. R. Quarendon. *Paint Manufacture,* v. 19, Mar. 1949, p. 92-94.

Bolometers, photo-elements, pneumatic cells, merits of infrared detectors, amplifiers and recorders, and the cathode-ray screen.

11-115. Application of the High Temperature Calorimeter to the Determination of the Heats of Formation of Na-Sn and Li-Sn Alloys. George R. Barber, Leo Brewer, LeRoy A. Bromley, Raleigh L. McKisson. *U. S. Atomic Energy Commission,* AECD-2294, July 1948, 36 pages.

Method devised for using the high-frequency induction coil as a high-temperature calorimeter. 24 ref.

11-116. Uber eine neue Einrichtung am Universal - Elektronenmikroskop zur fast vollständigen Vermeidung der thermischen Objekbelastung. (A New Device for the Universal Electron Microscope Which Will Almost Completely Protect the Sample From Heating.) Manfred von Ardenne. *Kolloid Zeitschrift,* v. 111, Oct. 1948, p. 22-30.

This device is a combination of a microscreen and hydrogen cooling. It will reduce the temperature at the object to such an extent that the electron density at the object can be multiplied six times before the same temperature is attained. Electron micrographs illustrate typical results.

11-117. Metalografia das ligas de aluminio-aluminio-niquel. (Metallography of Aluminum and Aluminum-Nickel Alloys.) Eros Orosco. *Boletim da Associacao Brasileira de Metais,* v. 4, Oct. 1948, p. 413-434; discussion, p. 435.

Reproduction of a series of colored photomicrographs of specimens prepared by use of a special method.

Composition of etching agents, optimum conditions of the process, and influence of different factors, such as time of etching, concentration of etching agents, etc. 22 ref.

11-118. Aluminum Oxide Films as Supports for Samples Being Studied by Means of the Electron Microscope. (In Russian.) S. L. Pupko. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 21, 1948, p. 259-260.

Method of production. Optimum conditions for separation of film from the base metal.

11-119. Investigation of Structural-Mechanical Properties of Metallic Dispersed Systems by Use of a Conical Plastometer. (In Russian.) B. Ya. Yampol'skii and N. A. Rebinder. *Kolloidnyi Zhurnal* (Colloid Journal), v. 10, Nov.-Dec. 1948, p. 466-474.

Special adaptation of the conical plastometer, in which the course of immersion of the cone is recorded automatically. Limited (minimum) stresses were determined for metallic Na and for amalgams of lead, with Pb contents of 32-90%, at various temperatures.

11-120. Determination of Electrical Conductivity of Metals and Alloys in a Rotating Magnetic Field. (In Russian.) A. R. Regel. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 18, Dec. 1948, p. 1511-1520.

New method for alloys and intermetallic compounds over a wide range of temperature, particularly in the region of the solid-liquid transition. Theoretical bases of the method. Practical application, including a description of the apparatus used. Typical determinations on indium. 15 ref.

11-121. Metallographic Investigation of Hard Alloys of the Metalloceramic Type (Carbides). (In Russian.) N. M. Zarubin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1434-1436.

Proposes the use of a series of reagents particularly applicable to individual components. Optimum conditions of determination.

11-122. Electrolytic Polishing of Metallographic Specimens. (In Russian.) A. I. Gershevich, T. A. Mikhailova, and D. O. Slavin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1437-1438.

A new composition of phosphoric-sulfuric acid electrolyte with the addition of chromium anhydride, glycerin, and water, which is particularly efficient for the polishing of high-Cr cast iron, stainless steel, and alloy steel using low voltages. Optimum conditions.

11-123. Application of the Method of Determination of Electrical Resistance in Investigation of Austenitic Alloys. (In Russian.) G. V. Estulin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1439-1444.

The relationship of electrical resistance of Cr-Ni steels, of the types 14-14, 18-8, 20-25, 15-60, to grain sizes. The method of investigation of the crystal structure of the above steels is based on this phenomenon.

11-124. Metallography of Aluminum Alloys. F. Keller. *American Society for Metals,* "Physical Metallurgy of Aluminum Alloys," 1949, p. 93-128.

Procedures which have been used successfully for many years for the various aluminum alloys. Numerous photomicrographs show typical structures.

11-125. Signification de la dimension cristalline mesurée d'apres la largeur de raie Debye-Scherrer. (Significance of Crystal Dimensions Measured by Use of the Widths of Debye-Scherrer Bands.) Félix Bertaut. *Comptes Rendus,* v. 228, Jan. 10, 1949, p. 187-189.

Critically analyzes Laue's formula for determination of apparent linear dimensions. Proposes use of a term which indicates the difference of the apparent dimension from that of the true mean dimension.

11-126. Essais des matériaux dans l'industrie métallurgique; Die Materialprufung in der Metallindustrie. (The Examination of Materials in the Metal Industry.) A. Meyer. *Pro-Metal,* v. 2, Feb. 1949, p. 316-327.

Colorimetric and metallographic methods. Apparatus and procedures. Structures of different alloys. (To be continued.)

11-127. Fuel Control in the Open-Hearth Plant. F. A. Gray. *Journal of the Institute of Fuel,* v. 22, Feb. 1949, p. 157-165.

Details of methods and equipment used by a British steel plant having both acid and basic furnaces. Besides temperatures, the control and measurement of air fuel ratio, furnace pressures, and gas flows are dealt with.

11-128. Crystal Setting by X-Rays. (In English.) J. W. Jeffery. *Acta Crystallographica,* v. 2, Mar. 1949, p. 15-21.

See abstract from *Journal of Scientific Instruments and of Physics in Industry,* item 11-73, 1949.

11-129. Crystal Symmetry and Physical Properties: Application of Group Theory. (In English.) S. Bhagavantam

and D. Suryanarayana. *Acta Crystallographica,* v. 2, Mar. 1949, p. 21-26.

Group-theoretical methods for studying the effect of symmetry on all possible physical properties (known and already measured or not known) which depend on crystal symmetry. Tables show the character of the transformation matrices for each possible combination of the above quantities, the number of independent constants needed to describe the corresponding phenomenon in each of the 32 classes, and actual examples of physical properties corresponding to the different possible combinations. 15 ref.

11-130. Note on the Bhagavantam-Suryanarayana Method of Enumerating the Physical Constants of Crystals. (In English.) H. A. Jahn. *Acta Crystallographica,* v. 2, Mar. 1949, p. 30-33.

A method alternative to that of Bhagavantam and Suryanarayana (see above abstract) for enumerating, by group theory, the number of independent constants for any physical property of crystals in the 32 classes. The method consists of finding first the explicit form of the representation in question for the full group of all rotations and reflections and then obtaining the form for the individual crystal classes by specialization.

11-131. The Measurement and Correction of Intensities From Single-Crystal X-Ray Photographs. (In English.) G. Kaan and W. F. Cole. *Acta Crystallographica,* v. 2, Mar. 1949, p. 38-43.

Effect of spot size in single-crystal X-ray photographs on errors in intensity measurements made by eye estimation and by direct photometry of the negative. Shows how the latter has been used to obtain intensities from equi-inclination Weissenberg photographs within an accuracy of $\pm 10\%$.

11-132. New Techniques Applied to the Buerger Precession Camera for X-Ray Diffraction Studies. Howard T. Evans, Jr., S. G. Tilden, and Douglas P. Adams. *Review of Scientific Instruments,* v. 20, Mar. 1949, p. 155-159.

Usefulness of the method for single-crystal X-ray diffraction studies is increased by several techniques.

11-133. Absorption Corrections in X-Ray Studies of Preferred Orientation. R. Smoluchowski and R. W. Turner. *Review of Scientific Instruments,* v. 20, Mar. 1949, p. 173-174.

A general formula is derived for evaluation of correction factors in flat specimens. In practical applications a graphical presentation proves to be particularly useful.

11-134. The Proton Microscope. Claude Magnan. *Nucleonics,* v. 4, Apr. 1949, p. 52-66.

Apparatus making possible magnifications of 600,000 or more, which has just been built at College de France, Paris. The electron microscope magnification limit is stated to be 100,000×. 24 ref.

11-135. Electronic Computer Applications. Part II. David Fidelman. *Radio-Electronic Engineering,* v. 12 (bound with *Radio & Television News,* v. 41), Apr. 1949, p. 6-9.

Use of electronic computers in various automatic process-control applications. Production methods for control of heat treatment process and for register in 3-color printing.

11-136. The Francis Thickness Tester: Application to the Measurement of Electrolytic and Hot-Dipped Tinplate Coatings. K. W. Caulfield and W. E. Hoare. *Sheet Metal Industries,* v. 26, Apr. 1949, p. 753-756, 762.

Slight modifications in the instrument first described by Howard T. Francis in 1948.

11-137. (Book) Multiple-Beam Interferometry of Surfaces and Films. S. Tolansky. 187 pages. 1948. Oxford University Press, Amen House, London, E.C.4, England.

Technique and achievements of the application of multiple-beam interference of light to the study of surface topography of solids and to the examination of properties of thin films. Applications in chemistry, crystallography, crystal physics, and metallurgy. 30 ref.

11-138. (Book) Transactions, Instruments and Measurements Conference (Stockholm, 1947). 252 pages. 1948. Norrköpings Tidninggars Aktiebolag, Norköping, Sweden.

Forty-one papers under the main headings of: Industrial Spectroscopy; Testing of Materials and Mechanical Measurements; Industrial Control; Metrology; and General and Miscellaneous Subjects. Most of the articles are in English, but a few are in French, German, or Swedish. The more important individual papers are being abstracted separately.

11-139. Une méthode de recherche et d'essai: le meulage en atmosphere raréfiée, associé a l'emploi de la diffraction électronique. (A Method for Research and Testing: Grinding in Vacuum Associated With Electron-Diffraction Investigation.) R. Courtel. *Revue de Métallurgie,* v. 46, Jan.

1949, p. 24-26.

See abstract of article from *Métaux & Corrosion*, item 11-230, 1948.

11-140. A New Method for Determining Austenitic Grain Size of Cast Steel. E. J. Eckel and S. J. Paprocki. *American Foundrymen's Society*, Preprint 5, 1949, 5 pages.

Method based on the intergranular diffusion of bronze into steel at elevated temperatures. It requires neither special apparatus nor difficult techniques, takes little time, and gives results said to be generally superior to those obtained by other methods.

11-141. Metallography of Cast Magnesium Alloys. P. F. George. *American Foundrymen's Society*, Preprint 22, 1949, 16 pages.

Method of metallographic specimen preparation, grinding and polishing, composition of etchants and specimen-etching techniques, interpretation of microconstituents and microstructures in magnesium alloys.

11-142. Application of Harmonic Analysis in Electronography. (In Russian.) B. K. Vainshtein and Z. G. Pinsker. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 1, 1949, p. 49-52.

Technique for application to electron-diffraction analysis of crystal structures. Mathematical development and graphical interpretation.

11-143. A New Magnetic Method for Measuring the Thickness of Composite Copper-Nickel Coatings. Abner Brenner and Eugenia Kellogg. *Instruments*, v. 22, Apr. 1949, p. 323.

The method involves measurement of the attractive force between the plated specimen and two permanent magnets of different strengths. The values thus obtained are used, in conjunction with a set of previously-determined calibration curves for each magnet, to obtain the total thickness of the coating and the relative thicknesses of the copper and nickel layers.

11-144. Metallographic Technique for Steel; Polishing. (Continued.) *Metal Progress*, v. 55, April, 1949, p. 504B.

Photomicrographs illustrate comparative flatness at edge of specimen; preservation of edges by iron plating; comparison of electrolytic and mechanical polishing; and false structure resulting from disturbed metal in 18-8.

11-145. Metallography of Aluminum Casting Alloys. A. M. Montgomery. *American Foundryman*, v. 15, Apr. 1949, p. 115-121.

Microscopic examination may reveal method of casting; type of alloy; type and extent of heat treatment; grain size; presence of voids, inclusions, or segregation; type and thickness of surface coatings; type and extent of corrosion; or type of fracture in a casting failure. Each of these applications to Al casting alloys is described following a discussion of the selection of specimens and the various polishing operations.

11-146. Divergent-Beam X-Ray Photography. W. May. *Nature*, v. 163, Apr. 9, 1949, p. 569-570.

Procedure and results of application to Al single crystals.

11-147. Lead Sulfide Photoconductive Cells. S. Pakswer. *Electronics*, v. 22, May 1949, p. 111-115.

Practical operating data and characteristics of recently improved cells. Present applications include sound-on-film transducers using infrared instead of conventional light sources, spectrophotometry, pyrometry, and industrial controls. 17 ref.

11-148. Etude aux rayons X de la répartition des dimensions des cristallites dans une poudre cristalline. (X-Ray Investigation of the Distribution of Crystallite Dimensions in a Crystalline Powder.) Félix Bertaut. *Comptes Rendus*, v. 228, Feb. 7, 1949, p. 492-494.

Mathematical development of a method for determining distribution from X-ray diffraction patterns.

11-149. Sur la détermination des indices et des épaisseurs des couches minces. (Determination of Indexes and Thicknesses of Thin Layers.) Florin Abeles. *Comptes Rendus*, v. 228, Feb. 14, 1949, p. 553-555.

New optical method. Theoretical bases. Technique of the method, application, and graphical interpretation of the results.

11-150. Frottement interne et anisotropie élastique des métaux et alliages. (Internal Friction and Elastic Anisotropy of Metals and Alloys.) Robert Cabarat, Léon Guillet, and René Le Roux. *Comptes Rendus*, v. 228, Feb. 14, 1949, p. 570-572.

Method using the specially developed apparatus of Cabaret. Results of determinations for Mg, Al, Fe, Pt, Cd, and Zn. It is believed that this method can also be applied to various alloys.

11-151. Cathodic Vacuum Etching of Metals. Don M. McCutcheon. *Journal of Applied Physics*, v. 20, Apr. 1949, p. 414-415.

Comparison of cathodic pattern with the best chemically etched micrograph showed that cathodic

treatment brought out the true microstructure with greater detail and clarity. Experimental technique for bringing out flow-lines in steel.

11-152. Spherical Particles for Electron Microscopy. G. David Scott. *Journal of Applied Physics,* v. 20, Apr. 1949, p. 417-418.

Usefulness in electron microscopy of Polystyrene Latex, No. 580G, which is a water suspension of spherical particles of remarkable uniformity of size. Measurements taken recently using a sample of this latex indicate that though the particles on any mount are of nearly uniform size within the limits of error, the same average size is not obtained consistently. Some method of ensuring uniformity of size is required before they can be used generally for precise size measurements.

11-153. A Device for Producing an Easily Identified Area on the Electron Microscope Specimen Screen. Francis W. Bishop. *Review of Scientific Instruments,* v. 20, Apr. 1949, p. 324-325.

Simple marking device consisting of a female brass block, counterbored to hold a specimen screen and a male element which holds a sewing needle of appropriate dimensions. The point of the needle may be adjusted for any degree of penetration into the specimen screen and is locked in place and centered by two opposing set screws.

11-154. Polishing Mineral Specimens. A. F. Hallimond. *Mining Magazine,* v. 80, Apr. 1949, p. 213-215.

A triple holder suitable for an ordinary rotating lap.

11-155. Electrical Controls in Thread-Grinder Design. E. V. Flanders. *Mechanical Engineering,* v. 71, May 1949, p. 381-388.

Reason for recent advances and typical examples.

11-156. High Speed Motion Pictures Aid in Analysis of Production Processes. Richard O. Painter. *Iron Age,* v. 163, May 5, 1949, p. 82-87.

How cameras operating at speeds up to 10,000 frames per sec. are used in miscellaneous studies, including metal-cutting-tool action, electrical conditions associated with mechanical contacts, and machining and cold heading studies in particular.

11-157. The Measurement of Permeability and Magnetic Losses of Non-Conducting Ferromagnetic Material at High Frequencies. H. J. Lindenhovius and J. C. van der Breggen. *Philips Research Reports,* v. 3, Feb. 1948, p. 37-45.

Rapid and accurate method. Some data obtained with compressed iron powder and with ferroxcube.

11-158. Methoden der Strukturforschung. (Methods of Structural Investigation.) Richard Glocker. "Physics of Solids" *(Office of Military Government for Germany),* Part I, p. 1-14.

Reviews German contributions, 1939-46. 75 ref.

11-159. On Variation in Materials, Testing, and Sample Sizes. Leslie E. Simon. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 877-881; discussion, p. 882-885.

Previously abstracted from preprint. See item 11-167, 1948.

11-160. A High-Temperature X-Ray Camera for Use With Plate Specimens. E. A. Owen. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Apr. 1949, p. 114-117.

Camera for use at temperatures up to apout 1000° C. It is arranged so that the specimen rotates in its own plane and is at the same time oscillated through small angles about a vertical in its surface. Indirect modes of temperature measurement. Samples of structure-spectra taken with a double specimen, aluminum and silver, at different temperatures.

11-161. Electrolytic Polishing of Iron and Steel. J. Pow. *Metal Treatment and Drop Forging,* v. 16, Spring 1949, p. 31-37.

Jacquet method for electro-polishing of ferrous specimens for microscopic examination.

11-162. Decomposition of Nital Etching Solutions. Howard H. Fawcett. *Metal Progress,* v. 55, May 1949, p. 659.

Violent decomposition, indicating need for special safety precautions.

11-163. Graphitization Rating Chart. D. B. Collyer and J. O. Light. *Metal Progress,* v. 55, May 1949, p. 664B.

Rating is done by comparing particle size in a microscopic image at 500 diam. magnification with the chart presented and by counting the particles in a 4 x 5-in. field on a ground-glass screen.

11-164. X-Ray Diffraction in Research. H. Lipson. *Research,* v. 2, May 1949, p. 202-209.

Survey of varied applications.

11-165. Thickness Tester for Tinplate Coatings. *Iron Age,* v. 163, May 12, 1949, p. 89.

A brief report. See abstract of "The Francis Thickness Tester: Application to the Measurement of Electrolytic and Hot-Dipped Tinplate Coatings," K. W. Caulfield and

W. E. Hoare. *Sheet Metal Industries,* item 11-136, 1949.

11-166. (Book) **The Instrument Manual.** 548 pages. United Trade Press, Ltd., 24, Bride Lane, London, E.C.4, England. 70s.

General information on industrial instruments operating on mechanical, optical, electrical, hydraulic, and pneumatic principles, for various industries, such as the engineering, textile, chemical, and metallurgical. Equipment for temperature and time determination, electrical and fluid-flow measurement, and for industrial-process control. Recent applications of electronics to instruments, such as the use of the Magnetron, the cathode-ray tube, and high-frequency heating.

11-167. (Book) **Minerals and How to Study Them. Ed. 3.** Edward Salisbury Dana. Revised by Cornelius S. Hurlbut, Jr. 323 pages. 1949. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y. $3.90.

Although much of the book has been rewritten, an effort has been made to maintain the same point of view for the same reader—the beginner in mineralogy. The sections on crystallography and physical mineralogy cover much the same ground as previously, but the chapters on chemical properties of minerals and the use of the blowpipe have been somewhat shortened. The chapter on description of mineral species has been completely rearranged and rewritten.

11-168. (Book) **Radioactive Measurements With Nuclear Emulsions.** Herman Yagoda. 356 pages. 1949. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

A coordinated study on the use of photographic emulsions in measuring radioactivity. The theory underlying the chemical and photographic operations involved; working methods in the fields of biology, radio-chemistry, metallurgy, mineralogy, and nuclear physics. 645 ref.

11-169. An Improved Method for Testing the Duration of Life of the Materials Employed as Electric Heating Resistors, Suggested for Use as a Standard International Method. Z. V. Ryska. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 263-276; discussion, p. 347-366.

The U. S. ASTM standard and the standard British and German methods compared. According to the method proposed, temperature is maintained by an automatic electronic method based upon selective sensitivity for infrared radiation.

11-170. Further Applications of Multiple-Beam Interferometry. S. Tolansky. *Science Progress,* v. 37, Jan. 1949, p. 1-11.

Studies of metal surfaces.

11-171. Cross-Section Drawing of 3-Inch Experimental Cupola. *Pig Iron Rough Notes,* Winter-Spring 1949, p. 16-17.

A dimensional cross-section drawing of the McWane Midget Cupola which was described in Autumn 1948 issue.

11-172. The Experimental Determination of the Soundness of Crystals From X-Ray and Density Measurements. (In English.) M. E. Straumanis. *Acta Crystallographica,* v. 2, Apr. 1949, p. 82-84.

Method which makes possible the detection of imperfections in crystals of elements, compounds, and solid solutions by determination of molecular weights from X-ray and density measurements. Precision determinations of density and lattice constants are necessary for the calculations. Some metallic elements and some compounds. 13 ref.

11-173. Limits of Accuracy in the Determination of Lattice Parameters and Stresses by the Debye-Scherrer Method. (In English.) Hans Ekstein and Stanley Siegel. *Acta Crystallographica,* v. 2, Apr. 1949, p. 99-104.

The chief factor limiting above accuracy is the spectral width of the primary characteristic radiation. For a diffraction line with a smooth intensity distribution, recorded on film, error of measurement caused by irregular fluctuations of density arising from the film grain is determined experimentally. Present accuracy of stress measurements by X-rays has, in favorable cases, reached the limit given by the spectral width of the characteristic radiation.

11-174. Die Absorption der Röntgenstrahlen in Kristallen im Interferenzfall. (Absorption of X-Rays by Crystals in the Case of Interference.) M. von Laue. *Acta Crystallographica,* v. 2, Apr. 1949, p. 106-113.

Experiments by Borrmann show that absorption of the primary X-ray in a perfect crystal is affected, and sometimes reduced, by the presence of diffracted rays. The case where both the primary and the diffracted rays leave the crystal slab

by the same face; the change of absorption of the primary ray is calculated according to the dynamical theory of X-ray diffraction and is found to be in general agreement with Borrmann's observations. 11 ref.

11-175. A Punched-Card Modification of the Beevers-Lipson Method of Fourier Synthesis. (In English.) M. L. Hodgson, C. J. B. Clews, and W. Cochran. *Acta Crystallographica,* v. 2, Apr. 1949, p. 113-116.

11-176. A Photoelectric Device for the Evaluation of Structure Factors. (In English.) H. Lipson and C. A. Taylor. *Acta Crystallographica,* v. 2, Apr. 1949, p. 130.

Device and typical results.

11-177. Determination of an Isothermal Transformation Diagram With an Optical Dilatometer. J. K. L. Andersen. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 29-32.

Determination for a Ni-Cr die steel, using a recording Leitz dilatometer equipped with a revolving casette. With this device accurate measurements of elongation as a function of time for undercooled austenite were made.

11-178. Experiences in the Study of Isothermal Transformations. T. F. Russell and C. Mavrocordatos. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 33-43.

Part I describes an apparatus for exploratory work on isothermal transformations of slowly reacting steels by the magnetic method. Self-recorded diagrams showing temperature and magnetic change in transformations requiring hundreds of hours. Limitations of the apparatus. In Part II, coefficients of thermal contraction of a number of austenites down to temperatures near the M_s points, and change of length of the specimen during isothermal transformation for a number of hypo and hyper-eutectoid steels. The effect of carbon on these changes, and the relation of final length to that of an aggregate of ferrite and carbide.

11-179. Size-Surface Analysis of Finely Ground Mill Products by Elutriation. E. O. Lilge and D. E. Pickett. *Western Miner,* v. 22, May 1949, p. 44-47.

Results of experiments with conventional apparatus. Linear diameter in itself is not a suitable yardstick to use in metallurgical calculations. Surface area is shown to form a better basis for such calculations. 13 ref.

11-180. Stanford's Research Laboratories Tackle Industry's Gage Problems. *Western Metals,* v. 7, May 1949, p. 19-21.

Precision-gage laboratory.

11-181. Three-Inch Cupola Aids Study of Carbon Absorption. *American Foundryman,* v. 15, May 1949, p. 62.

Previously abstracted from *Pig Iron Rough Notes,* item 11-13, 1949.

11-182. Phase Contrast in Electron Microscope Images. E. G. Ramberg. *Journal of Applied Physics,* v. 20, May 1949, p. 441-444.

Intensity distribution in the in-focus and out-of-focus image of an edge of a transparent thin film introducing a prescribed phase change in the incident beam. It is found that the resulting "phase contrast" increases both with film thickness and with degree of defocusing and, for thin specimens, exceeds other sources of contrast in magnitude.

11-183. Improved Sectioning Technique for Electron Microscopy. Richard F. Baker and Daniel C. Pease. *Journal of Applied Physics,* v. 20, May 1949, p. 480.

Improved procedure makes possible cutting and mounting 0.05-micron sections with an ordinary microtome.

11-184. Magnetometer Indicates Drawing Quality of Steel. *Automotive Industries,* v. 100, May 15, 1949, p. 41, 108.

Instrument which measures and records automatically the mechanical torque exerted by a uniform magnetic field on a circular disk of sheet iron or steel to determine uniformity of its magnetic properties.

11-185. New Optics Keep Sharper Eyes on Costs. *Modern Industry,* v. 17, May 15, 1949, p. 114-116, 118, 120, 122.

Miscellaneous uses of optical instruments in industry.

11-186. Röntgenapparater för industriella ändamal. (X-Ray Apparatus for Industrial Applications.) W. Ask. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 65-70.

A new type of X-ray apparatus developed especially for industrial use in Sweden. Specifications of apparatus and of its construction.

11-187. The Mikrokator Amplifying Mechanism and Its Use in Measuring Lengths and Loads. H. Abramson. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 177-181.

Precision-gaging device is said to be particularly adapted for indicating and checking machine tools.

11-188. Auswertung von Oberflächenschichten durch ein neues Schliffverfahren. (Determining the Thickness

of Surface Layers by a New Grinding Process.) H. Klemm. *Archiv fur Metallkunde,* v. 2, Jan. 1948, p. 12-15.

New method.

11-189. Die Rauhigkeitswert-Bestimmung mit Hilfe des Flachschliffverfahrens. (Determining the Degree of Roughness With Aid of a Flat-Grinding Process.) H. Klemm. *Archiv fur Metallkunde,* v. 2, Feb. 1948, p. 46-49.

The process is characterized by the fact that a plane is ground at a given angle to the surface to be investigated. The consequent enlargement of roughness depends on the angle of the "grind" to the investigated surface.

11-190. Gefugeanalytische geometrische Verfahren zur Bestimmung von Phasen unbekannter Zusammensetzung und ihrer chemischen Bindung. (Geometrical Method of Structure Analysis for Determining Phases of Unknown Composition and Their Chemical Bonding.) A. Schuller. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 73-75.

A petrographic method for determining the relative amounts of different phases in polynary systems. The microscopic instruments used for measuring the areas of different types of crystals. Examples of use.

11-191. On the Use of the Electron Reflector for Recording the Voltage Dispersion on the Surfaces of Metals and Semiconductors. (In German.) R. Orthuber. *Zeitschrift fur Angewandte Physik,* v. 1, Mar. 1948, p. 79-89.

A simple method of projecting the distribution of electrical potentials on metals and semiconductors onto a fluorescent screen in order to observe adsorbed foreign atoms on metal surfaces, electrical surface currents on semiconductors, potential patterns formed by photoelectric influences on semiconductor surfaces.

11-192. Uber Rauhigkeitsmessung mit dem Elektronenmikroskop. (Measuring Roughness With the Electron Microscope.) Robert Seeliger. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 170-172.

Method and its basic principles. Irregularities of 100 mμ or less can be accurately measured.

11-193. Uber den Temperatureinfluss bei Röntgenruckstrahlmessungen. (The Effect of Temperature on X-Ray Reflection Measurements.) Viktor Hauk and Eugen Osswald. *Zeitschrift fur Metallkunde,* v. 39, June 1948, p. 190-192.

A simple formula for temperature correction of lattice constants and linear-expansion coefficients with temperature. Factors for Fe and Al alloys, with gold and silver as the calibrating substances.

11-194. Berucksichtigung der wahren Abbeugungsrichtung der Strahlen bei der Berechnung der Verformung und Spannung aus Röntgenruckstrahlaufnahmen. I. Berechnung von Spannung und Verformung aus einer Ruckstrahlaufnahme unter Verwendung der Differentialform des Braggschen Gesetzes. (Consideration of the True Direction of Ray Refraction in Calculation of Deformation and Stress From X-Ray Diffraction Patterns. I. Calculation of Stress and Deformation From Diffraction Patterns by Application of the Differential Form of Bragg's Law.) Gunter Kemmnitz. *Zeitschrift fur Metallkunde,* v. 39, Aug. 1948, p. 254-256.

Formulas for elongation, angle of shear, and stress used in calculating the above. The results are compared with earlier ones.

11-195. Röntgenprufung oder Olabkochprobe zur Feststellung von Feinlunkern bei Magnesiumguss? (Should X-Ray or "Oil-Boiling" Tests Be Used for Determining Micro-Piping in Magnesium Castings?) H. Reininger. *Metall,* July 1948, p. 220-223.

More expensive X-ray method is less reliable than the "oil-boiling" test.

11-196. Graphische Darstellung und Auswertung von Siebanalysen auf Grund der Rosin-Rammler-Gleichung. (Graphic Presentation and Evaluation of Sieve Analyses Based on the Rosin-Rammler Equation.) Edgar Puffe. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, July 1948, p. 97-103.

The equation is based on the theory of probability. It is valid primarily for uniformly ground materials such as coal dust, cement, and pigments. Sieve analysis, advantages, and applications.

11-197. The Spectrographic Examination of Localized Heterogeneity in Metals. (In English.) J. H. Oldfield. *Spectrochimica Acta,* v. 3, Sept. 1, 1948, p. 354-366.

The area affected by the spark discharge in spectrochemical analysis is usually very small. Consequently errors may arise as a result of local variation in sample composition. In order to minimize these errors, methods have been devised to increase the amount of sample affected by the discharge. Conversely, a reduction of the area affected allows more detailed study

to be made of heterogeneity. A micro-spark technique was used for quantitative analysis of steel inclusions. Application to a wide variety of problems, including degree of diffusion of metals. A simple electrode holder which has considerably increased the accuracy of setting of the spark gap.

11-198. Verschleisskennwerte fur Zahnräder. (Characteristic Wear of Gear Wheels.) Heinz Glaubitz. *Archiv fur Technisches Messen,* Oct. 1948, T106, 2 p.

Methods for determination of the type and amount of gear-wheel wear.

11-199. A High Temperature X-Ray Diffraction Camera. James W. Edwards, Rudolph Speiser, and Herrick L. Johnston. *Review of Scientific Instruments,* v. 20, May 1949, p. 343-347.

Powder-diffraction camera designed to yield patterns at temperatures in excess of 2500° K. Preparation of sample. Camera is operated with a high vacuum or an inert-gas atmosphere.

11-200. An Apparatus for Producing Powder-Like X-Ray Diffraction Patterns From Single Crystals. F. W. Matthews and A. O. McIntosh. *Review of Scientific Instruments,* v. 20, May 1949, p. 365-366.

Gives results similar to an ordinary powder pattern. The standard X-ray powder index can be used.

11-201. Cells Drawn From Tantalum, Molybdenum, and Platinum for High Temperature Research. George W. Ziegler, Jr., Rudolph Speiser, and Herrick L. Johnston. *Review of Scientific Instruments,* v. 20, May 1949, p. 367.

Preparation.

11-202. The Statistical Nature of the Endurance Limit. J. T. Ransom and R. F. Mehl. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 364-365.

Using a new abbreviated statistical method known as "staircase testing". Results are for SAE 4340 steel.

11-203. Experimental Work Employing Radioisotopes: Cobalt and Selenium. Don McCutcheon. *Non-Destructive Testing,* v. 7, Winter 1948-1949, p. 7-14.

Methods of ordering and applications. Laboratory setup, recommended tests, and a radioisotope thickness gage.

11-204. Possible Industrial Applications of Soft X-Radiation 15 to 100 Kilovolts. E. Dale Trout, R. M. Gager, and A. L. Pace. *Non-Destructive Testing,* v. 7, Winter 1948-1949, p. 20-24.

Physical characteristics of X-radiation from production models of equipment, using tubes of conventional design with beryllium windows. Compares results with previous experimental ones.

11-205. Industrial Uses of Radioisotopes—A Bibliography. *Iron Age,* v. 163, June 9, 1949, p. 60-61.

68 general-background, survey, mining and metallurgy, and miscellaneous references.

11-206. A Method of Examining Metallographic Specimens While Subjected to Fatigue Stresses. P. J. E. Forsyth. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, May 1949, p. 160-161.

Small vibrator designed for the above purpose and used in conjunction with a stroboscope.

11-207. Autographic Torque Magnetometer Aids Selection of Special-Purpose Steels. *Instruments,* v. 22, May, 1949, p. 436-439.

New electromagnetic instrument.

11-208. Report of Committee E-4 on Metallography. *American Society for Testing Materials,* Preprint 74, 1949, 16 pages.

Miscellaneous recommendations and proposed revised tentative methods for preparation of micrographs of metals and alloys, including recommended practice for photography as applied to metallography.

11-209. Application of Nuclear Radiation to Industry. John R. Menke. *Nucleonics,* v. 4, May 1949, p. 2-6.

Potentialities by following a typical life-history of a nuclear particle and by examining functions that it might perform at each step. 23 ref.

11-210. Differential Pressures; An Electrical Pressure Meter for Their Measurement on Open-Hearth Furnaces. S. S. Carlisle and B. O. Smith. *Iron and Steel,* v. 22, May 12, 1949, p. 206-209; discussion, p. 267-268.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 11-103, 1949.

11-211. An Apparatus for the Production of Large Metallic Crystals by Solidification at High Temperatures. Louis Gold. *U. S. Atomic Energy Commission,* AECD-2258, Sept. 2, 1948, 12 pages.

Previously abstracted from *Review of Scientific Instruments,* item 11-70, 1949.

11-212. La radiographie électronique et ses applications en métallurgie. (Electronic Radiography and Its Applica-

tion in Metallurgy.) J. J. Trillat. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 79-83.

Improved methods for X-ray investigation of metals. The two methods (electronic radiography by reflection and by transmission) are particularly applicable for the study of metal surfaces, minerals, and castings. 15 ref.

11-213. Application de la spectrographie des rayons X a la physique des métaux. (Application of X-Ray Spectrography in the Study of the Physical Properties of Metals.) A. R. Weill. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 102-107.

Experimental method developed by Y. Cauchois for study of structures and phases. Data from a typical investigation of an Al-Cu alloy containing 4% Cu. 28 ref.

11-214. Etude des structures superficielles des métaux par les rayons X. (Study of Surface Structures of Metals by Means of X-Rays.) Ch. Legrand. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 147-150; discussion, p. 150.

Proposes X-ray diffraction. Theoretical bases, apparatus settings, and optimum conditions of operation.

11-215. Comparaison entre l'examen de microdureté et l'examen de spectrographie locale pour l'étude de zones minces de diffusion. (Comparison Between Use of Microhardness Determination and Examination by Local Spectrography for Study of Thin Zones of Diffusion.) H. Buckle and A. Keil. *Metaux & Corrosion,* v. 24, Mar. 1949, p. 59-64.

Comparatively analyzes the above methods. Results of investigation of an Al-Cu-Mg alloy indicate that microhardness determination is quite satisfactory. Microhardness is proportional to the copper content. Spectrographic examination, which is more accurate but also more complicated, may be used in doubtful cases. 12 ref.

11-216. Sur une méthode de haute sensibilité pour la détection micrographique des traces de déformations plastiques dans les alliages riches en cuivre. (A Method of High Sensitivity for the Detection, by Micrography, of Small Plastic Deformations in Copper-Rich Alloys.) Pierre A. Jacquet. *Comptes Rendus,* v. 228, Mar. 28, 1949, p. 1027-1029.

A new electrolytic method resulting in selective corrosion of deformed zones of the crystal structure of brass and Cu-Al alloys, subject to extremely small deformations. Optimum conditions of operation.

11-217. Production of Test Specimens From Silver Chloride for the Study of Stresses by an Optical Method. (In Russian.) S. O. Tsobkallo. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 338-345.

A method of producing polycrystalline AgCl sheets one-grain thick and also transparent AgCl bars. The pressing of AgCl strips and production of sheets one grain thick by recrystallization. Design of dies for pressing and optimum temperature and degree of deformation during recrystallization.

11-218. Quantitative Microstructural Analysis. (In Russian.) M. G. Smolovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 352-354.

Critically analyzes the formula of Blanter (v. 14, Apr. 1948) for determination of structural components and indicates that a grave error was made. Theoretical bases of proposed correction.

11-219. Method of Measuring Electromotive Force Induced During Friction and Wear. (In Russian.) M. L. Goldovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 380.

Apparatus and its theoretical basis.

11-220. Die Empfindlichkeit bei der quantitativen Autoradiographie. (Sensitivity in Quantitative Autoradiography.) K. Zuber. *Helvetica Physica Acta,* v. 22, Apr. 20, 1949, p. 112-118.

Experiments made to determine the efficiency of photographic plates for quantitative determination of radioactivity as in tracer research. Results compared with measurements using counting tubes.

11-221. Radioactivity Measurement Techniques. James H. Pannell. *U. S. Atomic Energy Commission,* AECD-2270, Nov. 13, 1947, 28 pages.

Techniques found useful in measuring alpha and beta particles and gamma rays. 15 ref.

11-222. Jet-Test for Determining the Thickness of Lead Coatings. R. A. F. Hammond. *Journal of the Electrodepositors' Technical Society,* v. 23, 1947-48, p. 113-120.

Preparation and standardization of a suitable reagent. Affect of temperature upon rate of penetration together with data concerning the stability of the reagent during storage.

11-223. Metallographic Examination of Beryllium Alloys. M. C. Udy, George K. Manning, and L. W. Eastwood. *U. S. Atomic Energy Commission,*

AECD-2553, Apr. 1948, 22 pages.
Reasonably satisfactory technique developed for Be and Be-rich alloys.

11-224. Spitzenzähler und Zählrohr bei metallographischen Oberflächenuntersuchungen. (Point Counters and Counting Tubes for Metallographic Surface Investigations.) J. Kramer. *Zeitschrift fur Physik,* v. 125, Mar. 15, 1949, p. 739-756.
A method for using these instruments or investigating the condition and structure of a metal surface by measuring thermionic emission. Typical data for a series of common metals.

11-225. X-Ray Microscopes. C. S. Barrett. *Metal Progress,* v. 55, June 1949, p. 848, 890-892.
X-rays should furnish ideal radiation for microscopy because of their short wave length. Problems involved in possible development of such instruments.

11-226. Harness Nuclear Fission to Measure Engine Wear. *SAE Journal,* v. 57, June 1949, p. 52-54. Based on "Application of Radioactive Tracers to Improvement of Automotive Fuels, Lubricants, and Engines", by P. L. Pinotti, D. E. Hull, and E. J. McLaughlin.

11-227. Die Anwendungsgebiete der technischen Röntgen- und Gammadurchstrahlung. (Fields of Application of Industrial X-Ray and Gamma Radiation.) E. A. W. Muller. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Apr. 15, 1949, p. 173-176.
A review. 186 ref.

11-228. Eine neue Aetzlösung fur Gusseisen und Stahl. (A New Etching Solution for Cast Iron and Steel.) Otto Schaaber. *Die Neue Giesserei,* v. 36 (new ser., v. 2), May 1949, p. 154.
Recommends use of a 1-3% solution of concentrated HNO_3 in concentrated acetic acid for metallography. Typical results.

11-229. Comparison of Methods for Determining Surface Area and Other Particle Size Data of Fine Powders, Particularly Welding Electrode Powders. P. D. Blake. *Journal of the Society of Chemical Industry,* v. 68, May 1949, p. 138-148.
Compares three methods — the Heywood, the Roller, and the modified Roller method—with data obtained by the hydrometer method.

11-230. An Electric Gage for Measuring the Inside Diameter of Tubes. Abner Brenner and Eugenia Kellogg. *Journal of Research of the National Bureau of Standards,* v. 42, May 1949, p. 461-464.
For measuring bores of about ½-in. inside diam. Operation depends on the mutual inductance of two coils. Diameter is read directly.

11-231. Pneumatic Feeder for Finely Divided Solids. C. W. Albright, J. H. Holden, H. P. Simons, and L. D. Schmidt. *Chemical Engineering,* v. 56, June 1949, p. 108-111.
Device developed by Bureau of Mines for uniform feeding of pulverized coal to a reactor. It should work with any finely divided solid.

11-232. The Trend Towards Automatic Control. A. G. Arend. *British Steelmaker,* v. 15, June 1949, p. 286-287.
Progress in automatic control in the chemical and artificial-fabric industries with advances in the steel industry. Recent American methods which are eliminating dependence on human skill.

11-233. Interferometric Determination of the Apparent Thickness of Thin Metallic Films. D. G. Avery. *Nature,* v. 163, June 11, 1949, p. 916.
Results of some experiments using the method described by Khamsavi and Donaldson in 1947. Measurements of the thinner film thicknesses obtained by this method should be treated with caution, since errors of the order of at least 30% may occur.

11-234. Strip Steel Extension Measured at Speeds of 2000 Feet Per Minute. *Steel,* v. 124, June 27, 1949, p. 80.
Method for indicating and recording percentage of extension during rolling in temper pass mills, using an extensometer.

11-235. A New Method of Measuring the Stopping Power of Several Materials for Alpha-Particles. F. Emmett Hammer and Frank E. Hoecker. *Review of Scientific Instruments,* v. 20, June 1949, p. 394-398.
Application of an atmospheric pressure alpha-particle detector to measurement of the above. Measurements of air-equivalent and relative stopping powers of films of mica, polystyrene, and aluminum. Relative stopping powers agree well with previous values.

11-236. Federgelenke fur Beanspruchungs- und Schwingungsmessgeräte. (Spring Joints for Stress and Vibration Measuring Instruments.) Heinrich Freise. *Archiv fur Technisches Messen,* May 1949, p. T33 (2 p.)
To eliminate unavoidable friction in ordinary types of joints and hinges, the use of spring joints for fine mechanical instruments is proposed.

11-237. Messung von mechanischen

Stosswellen. (Measuring Mechanical-Impact Waves.) F. J. Meister. *Archiv fur Technisches Messen*, May 1949, p. T34-T35 (4 p.)

The theory of computing impact waves, and several mechanical methods of measuring their intensity. 11 ref.

11-238. Nomogramme zur Ermittlung der Aufnahmebedingungen bei der röntgenographischen Grobstrukturuntersuchung. (Nomograms for Determining Operating Conditions for X-Ray Macroscopy.) H. Verse. *Metall*, v. 3, June 1949, p. 179-184.

To facilitate the production of high-quality X-ray pictures, available numerical data are correlated in the form of nomograms. 13 ref.

11-239. Nomogramm zur Bestimmung des Massenabsorption-skoeffizienten μ/ρ fur Röntgenstrahlen von 0,1 bis 3 A. (Nomogram for Determining the Mass Absorption Coefficient μ/ρ for X-Rays of 0.1 to 3 A Wave Length.) Rudolf Böklen and Sonya Geiling. *Zeitschrift fur Metallkunde*, v. 40, Apr. 1949, p. 157-158.

Develops on the basis of experimental measurements a new relationship for the above, and a nomogram for its quick application.

11-240. A Review of Methods for Coating-Thickness Determination. R. S. Bennett. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, June 1949, p. 209-216.

Various methods of nondestructively measuring the thickness of thin coatings on bases of a different material, usually mild steel. Two instruments were recently developed for use in the plating industry.

11-241. The Rapid Determination of Orientations of Cubic Crystals. C. G. Dunn and W. W. Martin. *Journal of Metals*, v. 1, sec. 3, July 1949, *(Metals Transactions*, v. 185), p. 417-427.

Method based on the fact that Bragg and azimuthal angles for two or more identified Laue diffraction spots completely determine the orientation of a crystal. Standard Laue photographs of the Majima and Togino type provide a ready means for identifying Laue spots. Outlines procedure in detail after brief treatment of X-ray problems connected with orientation determinations. Useful principles and techniques.

11-242. Mikroskopische und Röntgenographische Untersuchung. (Microscopic and X-Ray Investigations.) A. Schrader, H. Mahl, W. Hofmann, and H. Neerfeld. "Allegemeine Metallurgie" (Office of Military Government for Germany), 1948, p. 147-173.

Reviews German literature for 1939-46. Consists of separate sections as follows: preparation of polishing and etching compounds for microstructural studies (Schrader); the electron microscope (Mahl); X-ray investigation of structure (Hofmann); and X-ray measurement of elastic stresses (Neerfeld). 128 ref.

11-243. Application of Pneumatic Method for Evaluation of the Quality of Surface Finishes. (In Russian.) M. L. Brzhezinskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Mar. 1949, p. 20-22.

"Pneumatic profilograph" with automatic recording. It consists, essentially, of a hydraulic pressure regulator, a pneumatic chamber, a recording manometer, and a measuring attachment.

11-244. Röntgenbestimmung der Tiefenverteilung von Härte- und Nitrierspannungen. (Determining the Depth Distribution of Hardness and Nitration Stresses by an X-Ray Method.) Richard Glocker and Helmut Hasonmaier. *Archiv fur Metallkunde*, v. 40, May 1949, p. 182-186.

Preliminary experiments made to improve the sharpness of the X-ray lines with the crystal monochronator. The depth distribution of the internal stresses of hardened and nitrated steel was determined by step-wise etching and X-ray recording. A method of reducing the stresses of nitrated steel.

11-245. Sur la structure micrographique du laiton α-soumis a l'abrasion. (Micrographic Structure of α-Brass Subject to Abrasion.) Pierre A. Jacquet. *Comptes Rendus*, v. 228, May 2, 1949, p. 1439-1440.

A newly developed etching agent (formerly described in v. 228, 1949, p. 1027 item 11-216, 1949) permitted study of structural changes caused by the use of abrasives on annealed alpha-brass. Such a method seems to be applicable to the study of solid solutions of Cu-Zn, subject to other types of mechanical deformation.

11-246. Indicator for Small Amounts of Oxygen in Reducing Furnace Atmospheres. G. W. Rathenau and H. de Wit. *Metallurgia*, v. 40, June 1949, p. 114.

Simple devices in which gas flows through a glass bulb containing an electrically heated strip of stainless steel. If the oxygen pressure of the gas has exceeded the oxygen pressure of the chromium oxides at the heating temperature chosen, surface oxidation is readily observable. By varying the temperature of the strip the absolute value of the

oxygen pressure can be roughly determined.

11-247. The Determination of Static and Dynamic Yield Stresses Using a Steel Ball. R. M. Davies. *Proceedings of The Royal Society,* ser. A, v. 197, June 22, 1949, p. 416-432.

The above stresses of a thick steel plate may be estimated by pressing and by dropping a hard steel ball on a plane surface of the plate which has been ground and then polished. The static method consists of finding the least force which must be applied to the ball to produce a permanent indentation; and the dynamic method of finding the least normal velocity of impact which gives a similar indentation. 13 ref.

11-248. Determination of Space Groups by Intensity Statistics. D. Rogers. *Research,* v. 2, July 1949, p. 342-343.

Statistical method for study of the intensities of X-ray reflections recently proposed by Wilson. In favorable instances this opens up a new method of distinguishing between space groups.

11-249. High Temperature Furnace for Electron Diffraction Studies of Thin Films. Eileen I. Alessandrini. *Journal of Applied Physics,* v. 20, July 1949, p. 691-693.

Patterns are obtainable up to 1100° C.

11-250. Metallographic Technique for Steel; Photomicrography. *Metal Progress,* v. 56, July 1949, p. 80-B.

Photomicrographs illustrate effects of wave length and resolution; opening of field diaphragm and contrast; prism and plane glass illuminators; axial and conical illumination; and bright and dark-field illumination.

11-251. A Device to Deposit Automatically the Proper Thickness of Metals used in Shadow-Casting in Electron Microscopy. Francis W. Bishop. *Review of Scientific Instruments,* v. 20, July 1949, p. 527-529.

11-252. A Technique for the Production of Silica-Filmed Electron Microscope Screens in Quantity. Francis W. Bishop. *Review of Scientific Instruments,* v. 20, July 1949, p. 529-530.

11-253. A Simple Punch for Precision Cutting of Photographic Film in a Cylindrical X-Ray Diffraction Camera. E. J. Grill and A. H. Weber. *Review of Scientific Instruments,* v. 20, July 1949, p. 532.

11-254. A Magnetic Beam-Splitting Focusing Device for the Electron Microscope. Francis W. Bishop. *Review of Scientific Instruments,* v. 20, July 1949, p. 532-533.

11-255. Etude experimentale de la cinetique des transformations dans les corps solides. (Experimental Study of the Kinetics of Transformation in Solids.) M. G. Borelius. *Bulletin de la Société Chimique de France,* Mar.-Apr. 1949, p. D189-D192.

Different methods used at the Institute of Physics of the Polytechnic High School in Stockholm. Apparatus is suitable particularly for study of metals but may be applied to non-metals after slight modification.

11-256. The Evaluation of Hysteresis Core Loss by Power Equations. Horatio W. Lamson. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 96-111; discussion p. 112.

A study was made of exponents and coefficients occurring in the Steinmetz and Rayleigh equations for hysteresis core loss. Significance of exponents in the domain theory.

11-257. Magnetic Stress Analysis. P. E. Cavanagh and T. Wlodek. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 123-139; discussion p. 140.

Dyna-magnetic analyzer which provides a simple means for measuring internal microstresses or stress changes in parts as well as calibrating other magnetic test instruments. 29 ref.

11-258. Contribution a l'étude de la dilatation a haute température (Contribution to the Study of Expansion at High Temperature.) J. Pierrey. *Annales de Chimie,* v. 4, Mar.-Apr. 1949, p. 133-194.

An optical dilatometer suitable for use up to 2500° C. Using this apparatus, the coefficient of expansion of graphite was determined at 2300° C. along two axes of the crystal. The minimum percentage of refractory oxides necessary for stabilizing zirconium oxide was determined. The addition of very small quantities of CaO and MgO not only causes the ZrO_2 transformation point at 1100° C. to disappear, but causes this compound to be stable up to 2000° C. (from the dilatometric point of view). 58 ref.

11-259. The Calculation of the "Ideal" Resistance of Metals at Low Temperatures. (In English.) G. J. Van Den Berg. *Physica,* v. 15, Apr. 1949, p. 65-70.

Analyzes the above problem. 23 ref.

11-260. High Temperature X-Ray Camera. (In English.) H. L. Johnston. *Physica,* v. 15, Apr. 1949, p. 189-190.

Camera capable of use at temperatures up to 3000° K. with which successful X-ray diffraction patterns of Mo and Ta have been obtained at 2600° K.

11-261. Graphical Determination of Critical Points in Steel From Differential Dilatometric Curves. (In Russian.) A. N. Chervyakov and R. M. Rozenblyum. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 610-612.

11-262. Apparatus for Determination of Stresses During Different Types of Action of Tools. (In Russian.) N. P. Bezklubenko. *Zavodskaya Laboratoriya,* (Factory Laboratory), v. 15, May 1949, p. 616-618.

Its application to rolling-mill passes applied to sheet and tubes.

11-263. The Physical Limits of Some Measuring Processes. (Continued.) A. Mottu. *Microtechnic* (English Edition.), v. 3, May-June 1949, p. 98-111. Translated from the French.

Reversible microscopes for the comparison of standard scales and their accuracy. Profile projectors and surface-quality testing.

11-264. The Appreciation of the Various States of a Surface by the Method of Total Reflection. Armand De Gramont. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 118-120. Translated from the French.

Describes apparatus and procedures for determining by comparison whether machining meets certain requirements and conditions.

11-265. Metals in Instruments. A Metallurgical Survey of the Materials Used. E. H. Bucknall, *Journal of the Birmingham Metallurgical Society,* v. 29, June 1949, p. 55-80; discussion p. 81-84.

Previously abstracted from *Metal Industry*, item 3A-85, 1949.

11-266. Sur deux variantes de la méthode de Laue et leurs applications. (Two Variations of Laue's Method and Their Applications.) A. Guinier and J. Tennevin. *Acta Crystallographica,* v. 2, June 1949, p. 133-138.

A geometrical property of white X-radiation from a point source and reflected in a given family of crystal planes makes it possible to obtain photographs from which the scatter of the normals to these planes may be determined with an accuracy of 10 seconds of arc, even in a relatively large crystal. In this way, the degree of perfection of certain crystals was determined and a new type of imperfection discovered. An alternative arrangement gives an image of the crystal from which its position and orientation and the position of a region of imperfection can be determined. 12 ref.

11-267. Modern Optical Methods for Examination of Metals. H. Lloyd. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 116-120.

Proceedings of recent British Iron and Steel Research Assoc. meeting.

11-268. An X-Ray Method for Studying Rapid Phase Changes in Steels at High Temperatures. H. T. Heal and J. Savage. *Nature,* v. 164, July 16, 1949, p. 105.

Method which is believed to provide more accurate results than the usual method of study at room temperature after quenching.

11-269. Strain Gages for Measurement and Control of Displacement. *Product Engineering,* v. 20, Aug. 1949, p. 136-137. Condensed from "Bonded Resistance Wire Strain Gages as Components of Machinery and Gaging Equipment", by George N. Levesque.

Four gages are connected in a Wheatstone bridge circuit and the output passed through an electronic amplifier and indicator.

11-270. (Book) **The Principles of Metallographic Laboratory Practice. Ed. 3.** George L. Kehl. 520 pages. 1949. McGraw-Hill Book Co., 330 W. 42nd St., New York 18, N. Y. $5.50.

New edition retains the purpose of previous editions in presenting the fundamental principles of metallographic laboratory practice in a treatment that bridges the gap between theoretical physical metallurgy and its practical application in the laboratory. Thoroughly revised and rewritten to include the latest developments.

11-271. (Book) **Checking and Measuring Surface Forms.** (In German.) Johannes Perthen. (Karl Burger, editor.) 257 pages. 1949. Carl Hanser, Munich 27, Germany.

This is Vol. III of a set on technical measuring. The various methods and instruments. (From review in *Product Engineering*, v. 20, Aug. 1949.)

11-272. (Book) **Crystals and X-Rays.** K. Lonsdale. 199 pages. 1948. G. Bell & Sons, Ltd., York House, 6 Portugal St., Lincoln's Inn Fields, London, W.C.2, England.

Possibilities of X-ray crystallographic methods. Generation and properties of X-rays; geometry of crystals, X-ray methods of investigation; geometrical structure determination; determination of atomic and electronic distribution; extrastructural studies; and the im-

portance of the study of crystals.

11-273. (Book) **A Dictionary of Metallography. Ed. 2.** R. T. Rolfe. 287 pages. Chapman & Hall, Ltd., 37 Essex St., London, W.C.2, England. 18s.

In the present edition, 152 new terms have been added and two deleted, making a new total of 1,350 terms. In addition 250 terms have been extensively revised. Recommended wholeheartedly, especially to students and younger metallurgists. (From review in *Welding*, v. 17, July 1949.)

11-274. A New Method for Surface Reproduction. K. B. Mather. *Metal Progress*, v. 56, Aug. 1949, p. 225-227.

If a reasonably flat metal surface is pressed into a fine-grained photographic emulsion at about 15,000 psi., and the plate developed and examined under a microscope, a pattern is found that reproduces the surface contours. A pronounced three-dimensional appearance results. If standardized, it is believed that the method might give a quantitative measure of surface roughness.

11-275. Electroradiography. J. J. Trillat. *Metal Progress*, v. 56, Aug. 1949, p. 256, 258. Translated and condensed.

Previously abstracted from *Revue de Métallurgie*, item 11-212, 1949.

11-276. Single-Crystal Patterns in Electron Diffraction. H. Wilman. *Research*, v. 2, Aug. 1949, p. 352-362.

An illustrated review. 76 ref.

11-277. An Optical Device Facilitating Accurate Alinement. R. H. Brockman. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, July 1949, p. 231-233.

Application to a universal milling machine. Other potential applications.

11-278. The Precision Determination of Lattice Constants by the Powder and Rotating Crystal Methods and Applications. M. E. Straumanis. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 726-734.

A method of very high precision (in some cases more than 1:200,000, even with crystals of lower symmetry). The method tries to eliminate the errors of the Debye-Scherrer-Hull and rotating crystal methods by careful experimental technique. The films obtained are very clear, especially in the important back-reflection region. No standard substances are necessary and absorption corrections are negligible. Several applications. 54 ref.

11-279. Dead Time and Non-Linearity Characteristics of the Geiger-Counter X-Ray Spectrometer. Leroy Alexander, Elizabeth Kummer, and Harold P. Klug. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 735-740.

Satisfactory use of Geiger-counter methods for measurement of diffracted X-ray intensities demands that observed counting rates be corrected for the nonlinear response of the counter. Both the multiple-foil method calibrating nonlinearity of response and the two-source method of Beers for measuring counter dead time were found to be unsatisfactory. Electronically controlled oscillographic techniques were much more satisfactory.

11-280. Reflection Method of Determining Preferred Orientation on the Geiger-Counter Spectrometer. Michael Field and M. Eugene Merchant. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 741-745.

Rapid and accurate method especially valuable for dealing with thin layers on thick specimens.

11-281. An Improvement in the Shadow-Cast Replica Technique. S. J. Singer and R. F. Petzold. *Journal of Applied Physics*, v. 20, Aug. 1949, p. 816-817.

Use of ethyl cellulose instead of "parlodion" for stripping metal replicas.

11-282. Neutron Diffraction by Crystals. Kathleen Lonsdale. *Nature*, v. 164, Aug. 6, 1949, p. 205-209.

Properties of neutrons; their sources, methods of observation and measurement; their interaction with matter; experimental methods; and results of experiments. 24 ref.

11-283. Interpretation of Electron Micrographs Prepared by the Plastic Replica Process. J. Trotter. *Nature*, v. 164, Aug. 6, 1949, p. 227-228.

The upper surfaces of the replicas are not perfectly flat but have contours related to that of the surface being examined. By deposition in vacuum of a film of heavy metal on the surface of the replica, the disturbing influence of the nonplanar surface is eliminated. Results of a study of this surface by deposition of Cr before stripping from the base metal.

11-284. Optical Micrography. Jean Ternisien. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 134-139. Translated from the French.

Methods used in connection with the compound microscope for the study of thin transparent bodies and of opaque bodies (refractory oxides and metal alloys). (To be continued.)

11-285. Sur la mesure des dimensions

des particules d'oxyde de zinc. (Determination of the Size of Zinc Oxide Particles.) L. Habraken. *Revue de Métallurgie,* v. 46, Apr. 1949, p. 228-232.

Four different methods are optical and electron microscopy, turbidimetric analysis, and X-ray study. All four methods furnish quite concordant data, the direct method having the advantage of producing, in addition, mean values of particle size, thus indicating morphology of the particles. 32 ref.

11-286. Über die Mehrdeutigkeit der Kristallstrukturbestimmung. (Concerning the Ambiguity of Determination of Crystal Structures.) Georg Menzer. *Zeitschrift für Naturforschung,* v. 4a, Apr. 1949, p. 11-21.

The X-ray method does not always give accurate results. Criteria for several possible structures of a given reflex intensity and for the atomic arrangements of these structures. Tabulated data and mathematical formulas indicate methods of calculation and results.

11-287. Die Entwicklung eines Gerätes zum elektrolytischen Polieren (Glänzen) von Metallographischen Schliffen im Industrielaboratorium. (Development of an Apparatus for Electropolishing of Metallographic Samples in the Industrial Laboratory.) W. Engelhardt and R. Neuf. *Archiv für Metallkunde,* v. 3, May 1949, p. 180-185.

Design and operation of the above, and results for different metals.

11-288. Beiträge zur metallographischen Korngrössenmessung. I. Zur Messtechnik der Korngrössenmessungen. (Contributions to the Metallographic Determination of Grain Sizes. I. The Technique of Measuring Grain Sizes.) H. Kostron. *Archiv für Metallkunde,* v. 3, June 1949, p. 193-203.

The purpose, problems, and different methods. 29 ref.

11-289. Light Figures of Single Crystals of Zinc. Part I. Light Figures of Zinc Single Crystals Etched with Acids or Alkalis. (In Japanese.) Mikio Yamamoto and Jiro Watanabe. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Mar. 1949, p. 1-5.

Light figures produced by the three principal crystallographic planes etched for different time-intervals with various acids or alkalis, were observed and the suitabilities of the figures for determination of crystal orientation were examined.

11-290. New Worlds for Study. James Hillier. *Scientific Monthly,* v. 69, Sept. 1949, p. 161-168.

Various applications of electron microscopy to research in biology, metallurgy, and geology.

11-291. Application of Electronics in the Iron and Steel Industry. W. M. McKie and D. A. Lamont. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 59-67.

Circuit diagrams for various pieces of electronic equipment for the above, including motor control and power conversion, X-ray thickness gage, pinhole detector, current totalizer, and rotating regulator amplifier.

11-292. The Magnetic Sorting Bridge. L. F. Bates and N. C. Underwood. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Aug. 1949, p. 276.

Results of an extended series of measurements of the fundamental behavior of the above instrument, made under sponsorship of British Iron and Steel Research Association. Comparative magnetization curves for steel specimens of different carbon contents. Effects of Mn and Si contents on the cathode-ray pattern.

11-293. Sample Scanning Mechanism for X-Ray Diffraction. J. W. Hickman and A. G. Kleinknecht. *Review of Scientific Instruments,* v. 20, Aug. 1949, p. 573-574.

An automatic scanning mechanism for study of preferred orientations in worked materials for pole-figure representation.

11-294. Design of Equipment for Thermal Studies. Robert J. Teitel. *Review of Scientific Instruments,* v. 20, Aug. 1949, p. 575-578.

Versatile metallurgical furnace for high-temperature investigations of metals and alloys. Use to conduct thermal analysis and thermal treatments on Be-Fe alloys. A special thermal crucible was designed.

11-295. Operational Features of a New Electron Diffraction Unit. Robert G. Picard, Perry C. Smith, and John H. Reisner. *Review of Scientific Instruments,* v. 20, Aug. 1949, p. 601-611.

A new unit having a three-lens optical system and a maximum effective specimen-to-plate distance of 200 cm. Applications of such a system to the study of long interatomic spacings. Use of the unit as a shadow microscope. 11 ref.

11-296. Modified SR-4 Indicator To Measure Dynamic Strains. B. B. Hamner and H. Sommer. *Product Engineering,* v. 20, Sept. 1949, p. 143-145.

Modified indicator used in conjunction with a cathode-ray oscilloscope for a simple, inexpensive method of measuring dynamic strains.

11-297. Indium Replica for Metallurgical Examination. E. B. Roth. *U. S.*

Atomic Energy Commission, AECD-2461, Nov. 15, 1948, 10 pages.

Technique especially suitable for making replicas behind radioactive shielding in a "hot" laboratory.

11-298. Etchants for Microexamination of Cast Magnesium Alloys. *Foundry,* v. 77, Sept. 1949, p. 135.

Table gives compositions, etching procedures, characteristics, and uses for 10 etchants.

11-299. Changes in Solids Bombarded by Electrons in the Electron Microscope. (In Russian.) A. I. Echeistova and A. B. Shakhter. *Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences), May-June 1949, p. 238-241.

Changes of structure (consolidation of particles and filling up pores) of finely dispersed solid bodies during electron-microscope examination were studied. Shows that the coating does not consist of metallic atoms but is a layer of carbon or carbon-containing substance.

11-300. Méthode d'étude des métaux à l'aide des perméamètres à enroulements démontables. (Method of Study of Metals Using Permeability Meters With Interchangeable Coils.) I. Epelboin, A. Marais, and P. Pannetier. *Revue de Métallurgie,* v. 46, May 1949, p. 315-318.

A newly developed instrument for the study of magnetic properties over a wide range. Method of operation.

11-301. Remarques sur les procédés physiques et mécaniques de controle des produits en alliages légers en cours et en fin de fabrication. (Remarks Concerning Physical and Mechanical Methods for Control of Light-Alloy Products During Their Production and After Their Completion.) M. Renouard. *Revue de Métallurgie,* v. 46, June 1949, p. 345-353.

Macrographic, micrographic, spectrographic, and X-ray investigation methods, and application to individual steps of production.

11-302. Nouvelle méthode de précision pour la mesure de la maille individuelle des grains. Application à l'étude de l'écrouissage et de la recristallisation. (A New Method for Determination of Size of Individual Grains. Application to the Study of Strain Hardening and Recrystallization.) C. Crussard and F. Aubertin. *Revue de Métallurgie,* v. 46, June 1949, p. 354-359; discussion, p. 359.

The proposed method permits determination of grain size with an accuracy of 0.00002. By a variation of the method, determination of the size of individual grains is possible. Application of this method to the study of strain hardening and recrystallization reveals that true grain size is different from average grain size determined by standard methods. Difference depends on cold working and heat treatment variables.

11-303. La microradiographie. Application à l'étude des alliages légers. (Microradiography. Its Application in the Study of Light Alloys.) Fernand Fournier. *Revue de Métallurgie,* v. 46, June 1949, p. 360-362; discussion, p. 362.

A newly developed apparatus for investigation by X-ray diffraction of minute amounts of material. Method of investigation.

11-304. Zur Frage der Verschleierung des Bildes in der Auflicht-Mikroskopie. (The Problem of Blurred Images in Reflected-Light Microscopy.) H. Klemm. *Archiv für Metallkunde,* v. 3, June 1949, p. 221-223.

Function of the aperture and field diaphragms and the blurring effect caused by an excessive amount of light and by reflection of light from the objective. A method of correcting this effect.

11-305. Erfahrungen bei der Anwendung der Elektronenbeugung zur Untersuchung fester Körper. (Experiences in the Use of Electron Diffraction for Investigation of Solids.) R. Forster and E. Brandenberger. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, July 1949, p. 215-224.

Electron rays are superior to X-rays in the study of thin films and crystal surfaces, characterization of fine crystalline and amorphous substances. 10 ref.

11-306. Ein einfaches Verfahren zur Messung der Viskosität bei hohen Temperaturen. (A Simple Method for Measuring Viscosity at Elevated Temperatures.) Adolf Knappwost. *Zeitschrift für Metallkunde,* v. 39, Oct. 1948, p. 314-318.

Method especially suitable for molten metals. Theoretical basis of the method and experimental verification.

11-307. Über einen Weg zur Bestimmung der absoluten Oberfläche von unedlen Metallen. (A Method for Determining the Absolute Surface of Base Metals.) Otto Erbacher, Gisela Jensen-Hellmann, and Auguste Mellin. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 249-255.

The method is based on a simple electrochemical ionic exchange in which lead nitrate-thorium B dissolved in a noncorrosive solvent is adsorbed on the ground and polished surfaces of the base metals. The experimental procedure and typical results. 11 ref.

11-308. Über die elektronenmikroskop-

ische Darstellung von feinen, lockeren Fremdschicten auf Oberflächen. (An Electron-Microscopic Method of Investigating Smooth, Porous Surface Films of Foreign Matter.) Robert Seeliger. *Zeitschrift für Metallkunde,* v. 40, July 1949, p. 255-256.

Two electron micrographs of duralumin are shown and discussed.

11-309. The Isolation of Carbides From High Speed Steel. D. J. Blickwede and Morris Cohen. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 578-584.

Development of an electrolytic extraction technique for quantitatively isolating the carbides from both annealed and hardened high speed steel. Particular attention is paid to amount, as well as composition, of the carbides. Illustrative results are given for M-2 grade W-Mo steel. 25 ref.

11-310. Rapid Polish With Diamond Hand Hone. L. P. Tarasov. *Industrial Diamond Review,* new ser., v. 9, Aug. 1949, p. 231, 254.

Use for polishing metallographic specimens.

11-311. Sur l'utilisation du champ magnétique et du microscope polarisant pour l'identification des micro-cristaux. (Concerning Utilization of a Magnetic Field and a Polarizing Microscope for Identification of Micro-Crystals.) Aimé Cotton. *Comptes Rendus* (France), v. 228, June 8, 1949, p. 1775-1777.

Simple technique.

11-312. Sur la mesure de la perméabilité magnétique en ultra-haute fréquence. (Concerning Measurement of Magnetic Permeability at Ultra-High Frequencies.) Pierre Grivet. *Comptes Rendus* (France), v. 228, June 8, 1949, p. 1796-1799.

Method in which the metal being studied forms the central wire of a coaxial conductor. Results for ferronickel at 3-cm. wavelength agree qualitatively with theory.

11-313. Mesure de la constante gyromagnétique du fer et du nickel. (Measurement of the Gyromagnetic Constants of Iron and Nickel.) André J. P. Meyer. *Comptes Rendus* (France), v. 228, June 20, 1949, p. 1934-1935.

Characterized by evaluation of the degree of influence of the Doppler-Fizeau effect on the spectral bands. Formula for computation of obtained data and its graphic interpretation.

11-314. Sur une méthode experimentale d'étude de la température réellement atteinte au cours du meulage dans les couches superficielles d'un échantillon métallique: Cas du cobalt. (Concerning an Experimental Method for Study of True Temperature Attained During Surface Grinding of a Metallic Specimen: The Case of Cobalt.) Robert Courtel. *Comptes Rendus* (France), v. 228, June 27, 1949, p. 2031-2033.

A method in which the metal is ground in vacuum, with electron-diffraction control and recording. Factors involved and difficulties encountered in the case of cobalt.

11-315. Beiträge zur metallographischen Korngrössenmessung. II. Zwei neue Schnellverfahren zur Kornquerschnittsbestimmung. (Metallographic Methods for Measuring Grain Sizes. II. Two New Rapid Methods for Determining Grain Sizes.) H. Kostron. *Archiv für Metallkunde,* v. 3, July 1949, p. 229-242.

The photographic and the "rectangular" processes and comparison with the ASTM grain-sizing scale. The relation between the grain size of a metal and its properties.

11-316. (Book) X-Ray Optics; The Diffraction of X-Rays by Finite and Imperfect Crystals. A. J. C. Wilson. 127 pages. 1949. Methuen & Co., Ltd., London, England.

One of a series of monographs intended for readers of average scientific attainment. The necessary mathematics is introduced gradually, the earlier chapters requiring little more than elementary trigonometry.

11-317. Methods of Determining Vapor Pressure of Metals. Rudolph Speiser and H. L. Johnston. *American Society for Metals,* Preprint No. 11, 1949, 26 pages.

Various methods, in particular, the theory and practice of the Langmuir evaporation method and the Knudsen effusion method. Vapor-pressure equations used to represent experimental data, and methods of calculating thermodynamic functions from vapor pressures, heat capacities, and spectroscopic data. 23 ref.

11-318. Preparation of Metal Single Crystals. A. N. Holden. *American Society for Metals,* Preprint No. 35, 1949, 29 pages.

Basic processes and their numerous variations used to grow or form metal single crystals. Experimental difficulties encountered with the various methods. Methods of growing crystals of desired orientations are included. 159 ref.

11-319. Application of Automatic Control to Open-Hearth Furnaces. E. Whitehead. *Journal of the Iron and Steel Institute,* v. 163, Sept. 1949, p. 1-8.

Some of the factors which require automatic control. Why priority is given to air-fuel ratio, furnace pressure, roof temperature, and reversal. Attention is drawn to some major

sources of error. Basic principles of automatic control presented in a simple nonmathematical way.

11-320. Das Walzdruckmessgerät mit induktiver Feinmesslehre. (Rolling-Pressure Measuring Instruments With Inductive Micrometer Gages.) Norbert de Ball. *Archiv für technisches Messen,* Dec. 1948, p. T118-T119 (4 pages).

Various types of instruments used to measure applied pressures when rolling metals and nonmetals. 11 ref.

11-321. Method of Production of Replicas of Definite Submicroscopic Areas of Solid Surfaces. (In Russian.) I. I. Tret'yakov and A. B. Shekhter. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 11, 1949, p. 231-233.

Method is particularly important in electron microscopy.

11-322. Technical Factors in Testing Pipe Line Coatings. D. E. Stearns, M. W. Belson, and Robert H. Lee. *Corrosion,* v. 5, Oct. 1949, p. 342-346.

Development of the holiday (defect in coating) detector in its present form.

11-323. Surface Reproduction. Utilization of the Pressure Effect of Photographic Emulsions. K. B. Mather *Metal Industry,* v. 75, Sept. 16, 1949, p. 227-228.

Previously abstracted from *Metal Progress.* See item 11-274, 1949.

11-324. New Test Predicts Deep Drawing Properties of Steel Sheet. Kenneth Rose. *Materials & Methods,* v. 30, Oct. 1949, p. 62-63.

How drawability of steel is quickly and accurately indicated by the torque magnetometer, developed by U. S. Steel.

11-325. Cathodic Vacuum Etching Applied To Metal Surface Examination. *Modern Machine Shop,* v. 22, Oct. 1949, p. 182-184.

New etching process to prepare metal surfaces for microscopic examinations and photography. The method, developed by the Ford Motor Co., utilizes ionized atoms.

11-326. Note on Some Plastic Flow Effects in Steel. R. Loojes and H. J. Vink. *Journal of Applied Physics,* v. 20, Sept. 1949, p. 884-885.

A method, using interference fringe measurements, for studying deflections occurring in simple cases of plastic flow in steels.

11-327. Metallographic Examination of Beryllium Alloys. M. C. Udy, G. K. Manning, and L. W. Eastwood. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 779-784.

Development of a reasonably satisfactory technique for identifying 14 different phases in various alloys of beryllium.

11-328. A Survey of Sieve Series and Grade Scales. Robert E. Morey. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 286-296; discussion, p. 296.

Existing sieve series and grade scales for determining particle size of particulate materials. Good and bad points of the various scales. Proposes a grading system which combines the best features of existing systems to produce a uniform system which may be acceptable to all who measure and control particle sizes in science and industry. 35 ref.

11-329. Metallographic Technique for Mounting Porous Compacts. R. Wachtell. *Powder Metallurgy Bulletin,* v. 4, Sept. 1949, p. 126-128.

11-330. How to Measure Surface Roughness of Castings. G. Hobman. *American Foundryman,* v. 16, Oct. 1949, p. 46-47.

Use of dial gage and stylus-type contact point.

11-331. New Machine Evaluates Blasting Material Life. *SAE Journal,* v. 57, Oct. 1949, p. 45-47.

Machine that tests blast cleaning shot and abrasives, producing an effect comparable to actual blasting operations. Data for common materials.

11-332. X-Ray Powder Diffraction Analysis Film and Geiger Counter Techniques. William Parrish. *Science,* v. 110, Oct. 7, 1949, p. 368-371. A condensation.

A few new techniques and instrumentations developed at Philips Laboratories, Irvington-on-Hudson, N. Y., during past 6 years. 12 ref.

11-333. Two Radioactive Methods for Studying Certain Gas-Metal Reactions. Clifford K. Beck. *Science,* v. 110, Oct. 7, 1949, p. 371-372. A condensation.

Techniques have proved useful and convenient in studying rate, time dependence of rate, total magnitude of reactions, and certain properties of deposited films.

11-334. Study of Adherence of Molten Glass to Heated Metals. J. A. Kapnicky, H. V. Fairbanks, and W. A. Koehler. *Journal of the American Ceramic Society,* v. 32, Oct. 1, 1949, p. 305-308.

Kinetic test for evaluating this adherence. Results are expressed in terms of the highest metal temperature at which a drop of molten glass shows no adherence. This temperature was determined for several cast irons and nonferrous metals and

alloys. It is affected by structure and surface roughness. Effects of cyaniding, carburizing, nitriding, quenching, and annealing were also determined as well as general effect of mold lubricants on adherence temperature.

11-335. Kornfärbungs- und Schraffurätzung von Aluminium-Kupfer-Magnesium-Legierungen. (Grain Coloration and Line Etching of Aluminum-Copper-Magnesium Alloys.) Hans Kostron. *Zeitschrift für Metallkunde,* v. 39, Nov. 1948, p. 333-342.

Thoroughly describes above types of etching. 21 ref.

11-336. Some Experiences in the Application of the Electron Microscope to the Study of Steels. F. W. Cuckow and J. Trotter. *Proceedings of the Physical Society,* v. 62, sec. B, June 1, 1949, p. 360-365.

Steel specimens were examined with light and electron microscopes. The micrographs are critically examined and compared. There is an obvious gain in picture sharpness in the electron micrographs. However, interpretation of the micrographs from plastic replicas in terms of geometry of the specimen surfaces is more straightforward.

11-337. A Unit-Magnification Optical System for the Attainment of Long Working Distances in Microscopy. J. Dyson. *Proceedings of the Physical Society,* v. 62, sec. B, Sept. 1, 1949, p. 565-575.

A system giving unit magnification and used in conjunction with a conventional microscope was selected as suitable. Aberrations of such a system and means of correcting them. Typical results.

11-338. A Geiger Counter Spectrometer for the Measurement of Debye-Scherrer Line Shapes. W. H. Hall, U. W. Arndt and R. A. Smith. *Proceedings of the Physical Society,* v. 62, sec. A, Oct. 1, 1949, p. 631-638.

Monochromatic radiation is used, and diffracted-beam intensity is recorded by a Geiger counter. Intensity of the X-ray source is monitored continuously, and errors due to variations in its output are automatically compensated. Accuracy and resolution obtainable are demonstrated by some typical experimental results. 14 ref.

11-339. Preparation of Micrographs of Metals and Alloys; Including Recommended Practice for Photography as Applied to Metallography. *Foundry,* v. 77, Nov. 1949, p. 115-116.

Proposed revised tentative ASTM methods.

11-340. A High Temperature Precision X-Ray Camera. Some Measurements of the Thermal Coefficients of Expansion of Beryllium. Paul Gordon. *Journal of Applied Physics,* v. 20, Oct. 1949, p. 908-917.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2426. See item 11-79, 1949.

11-341. Electron Microscope and Diffraction Study of Metal Crystal Textures by Means of Thin Sections. R. D. Heidenreich. *Journal of Applied Physics,* v. 20, Oct. 1949, p. 993-1010.

Bethe's dynamical theory of electron diffraction in crystals is developed using the approximation of nearly free electrons and Brillouin zones. Concluded that the kinematic theory is inadequate for interpreting electron images of crystalline films. An electrolytic method for preparing thin-metal sections for electron microscopy and diffraction; application to cold worked Al and an Al-Cu alloy. Suggested that nucleation and growth reorientation are responsible for self-recovery in cold-worked metals. Formation of $CuAl_2$ precipitate particles. 18 ref.

11-342. Characteristics of Metallographic Polishing Powders. E. C. Rollason, E. Sharratt, and R. R. Roberts. *Journal of the Iron and Steel Institute,* v. 162, July 1949, p. 265-270.

Physical properties of powders used for metallographic polishing of mild steel specimens were studied. The most essential factor is that the particles shall be plate-shaped. Polishing depends largely on friction between the powder and the specimen, and not on cutting action. Use of gamma alumina and alpha alumina. 14 ref.

11-343. Monochromateur-focalisateur logarithmique: Application à l'étude de la texture et des déformations des cristaux. (Logarithmic Monochromator-Focuser: Application to Study of the Structure and Deformation of Crystals.) Jean Barraud. *Comptes Rendus* (France), v. 229, Aug. 1, 1949, p. 378-380.

Optical setup of instrument. Application to a sample of mica.

11-344. Handlicher Schichtdicken-Messer Hoher Messgenauigkeit. (Handy and Highly Accurate Layer-Thickness Meter.) R. Berthold. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Sept. 15, 1949, p. 476-478.

The proposed instrument for measuring the thicknesses of non-ferromagnetic layers or ferromagnetic materials consists of pole pieces of non-permanent-magnetic but highly permeable material. It can

measure thicknesses up to 1 mm. with an average accuracy of 10%.

11-345. Die Messung der mechanischen Dämpfung der Metalle. (Measuring the Mechanical Damping of Metals.) Cord Petersen. *Archiv für technisches Messen,* Sept. 1949, p. T74-T76. (6 p.)

Methods and commonly used apparatus. 23 ref.

11-346. The Accuracy of Interatomic Distances Obtained in Electron Diffraction Investigations of Molecular Structures. (In English.) D. W. J. Cruickshank and H. Viervoll. *Acta Chemica Scandinavica,* v. 3, no. 6, 1949, p. 560-568.

Methods of correcting systematic errors of finite integration in the radial distribution functions of electron diffraction. A method for estimating standard deviations in interatomic distances, due to random experimental errors, approximation errors in calculation, and any inaccuracies in correction for finite integration. 10 ref.

11-347. Determination of Crystal Orientation of Hexagonal Metal Single Crystals by the Light-Figure Method. (In Japanese.) Miko Yamamoto and Jiro Watanabe. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 9-14.

Procedure and accuracy explained for the case of zinc single crystals of cylindrical-rod shape.

11-348. An Evaluation of Radioactive Isotopes in Metallurgy. C. E. Birchenall and W. O. Philbrook. *Iron Age,* v. 164, Nov. 10, 1949, p. 77-82, 174.

Advantages and limitations of radioactive tracers in metallurgical research and development. Characteristics of various radioisotopes and experiences obtained in investigating potential applications. Handling and exposure problems.

11-349. Optical Diffraction Patterns Produced by Bubble Rafts. J. Dyson. *Proceedings of the Royal Society,* ser. A, v. 199, Oct. 7, 1949, p. 130-139.

Method of obtaining diffraction patterns, analogous to X-ray and electron diffraction patterns, from photographs of assemblies of $\frac{1}{16}$-in. metal balls. The experiments have two potential uses. In the first place, it may be possible to obtain some insight into relationships between observed phenomena in X-ray and electron diffraction and crystal imperfections which cause them. In the second place, the method of inspection of the raft by means of light contained in a restricted portion of the diffraction pattern offers a ready method of investigating effects produced by dislocations.

11-350. Die materialtechnische Prüfung von zahnärztlichen Materialien. (Technical Testing of Dental Materials.) W. Rimathé. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Sept. 1949, p. 270-273.

German and foreign work concerned with both metallic and nonmetallic materials.

11-351. Preparation of Metallographic Sections and Development of Microstructure of Metal-Ceramic Solid Alloys. (In Russian.) I. N. Chaporova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 799-805.

"Metal-ceramic solid alloys" consist basically of tungsten and titanium carbides plus smaller amounts of other metallic carbides. Metallographic technique; etching compositions and conditions.

11-352. Method of Investigation of the Structure of Complex Alloys Using the Electron Microscope. (In Russian.) D. S. Shraiber and E. K. Molchanova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 806-810.

Special technique and typical results.

11-353. Accuracy of Determination of Limits of Solubility in Binary Metallic Systems. (In Russian.) I. L. Rogel'berg and S. Kh. Kipnis. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 814-817.

Results of a thorough analysis of the various factors involved. 12 ref.

11-354. Study of Microplasticity of Commercial Alloys by Means of a "Microscreen". (In Russian.) T. I. Gudkova, N. E. Karskii, and G. I. Sobolev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 818-821.

Method of drawing a microscreen, for the purpose of graduating in hundredths of a millimeter. Applicability of such a microscreen.

11-355. Interpretation of "Ultra-Fine" Structures of X-Ray Absorption Spectra of Solids. (In Russian.) A. I. Kostarev. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki* (Journal of Experimental and Theoretical Physics), v. 19, May 1949, p. 413-420.

Details of methods and application to Cu and α-Fe. Influence of type of crystalline lattice on character of fine structure of X-ray absorption spectra.

11-356. A Photo-Grid Technique for Sheet Metal Elongation Measurements. *Technical News Bulletin* (National Bureau of Standards), v. 33, Nov. 1949, p. 125-127.

Technique developed at National Bureau of Standards.

11-357. A Small Laboratory Arc Furnace. G. Hutt and A. Schneider. *Engineers' Digest,* v. 10, Oct. 1949, p. 354. Translated and condensed from Archives of the Board of Trade, German Division.

Furnace for temperatures above 2000° C., and for vacuum or inert-gas operation. It permits approximately quantitative collection of sublimates, and direct resistance heating of the melt.

11-358. Metallurgical Achievements of the Electron Microscope; A Review of the Literature to the End of 1948. G. A. Geach. *Metallurgia,* v. 40, Oct. 1949, p. 319-326.

Includes typical electron micrographs. 111 ref.

11-359. Dosage, par diffraction des rayons X, des corps ou des phases cristallisées dans leurs mélanges. (Determination of Substances or Crystallized Phases in Mixtures by Means of X-Ray Diffraction.) G. W. Brindley. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. D59-D63.

The method, advantages and disadvantages. Possible large errors in determination and ways to avoid them. Typical results. 10 ref.

11-360. La structure des surfaces de zinc polies électrolytiquement. (Surface Structure of Electropolished Zinc.) H. Raether. *Métaux & Corrosion,* v. 24, June 1949, p. 145-148.

Method using electron diffraction and measurement of dissociation potential. Conditions of experimental investigation.

11-361. Graphical Study of Metallurgical Equilibria. M. J. N. Pourbaix and C. M. Rorive-Bouté. *Faraday Society,* "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 139-154; discussion, p. 217-244. Translated from the French.

Previously abstracted from *Faraday Society Transactions,* Preprint, Sept. 1948. See item 11-254, 1948.

11-362. A Method for Determining the Origin of Surface Defects in Rolled Steel Products. C. L. Meyette and V. E. Elliott. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 201-215; discussion, p. 216-218.

Previously abstracted from *Metals Technology.* See item 11-179, 1948.

11-363. X-Ray Determination of Retained Austenite by Integrated Intensities. B. L. Averbach and M. Cohen. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 401-414; discussion, p. 414-415.

Previously abstracted from *Metals Technology.* See item 11-31, 1948.

11-364. Correlation of Optical and Electron Microscopy. J. S. Bryner. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 356-362.

Previously abstracted from *Metals Technology.* See item 11-178, 1948.

11-365. Metallography of Beryllium. A. R. Kaufmann, P. Gordon, and D. W. Lillie. *Metal Progress,* v. 56, Nov. 1949, p. 664-665.

A satisfactory etchant has not been found for revealing the microstructure of Be. Therefore, the unetched metal was examined with polarized light. Details of technique.

11-366. Metallography of Indium and Indium-Rich Alloys. S. C. Carapella and E. A. Peretti. *Metal Progress,* v. 56, Nov. 1949, p. 666.

Describes suitable metallographic technique. A typical example is illustrated.

11-367. Metallography of Zirconium and Zirconium Alloys. A. H. Roberson. *Metal Progress,* v. 56, Nov. 1949, p. 667-669.

Specimen preparation techniques and etchant compositions, including electrolytic etchants. Twelve photomicrographs show typical results, as-cast, and after quenching, rolling, etc.

11-368. Cathodic Vacuum Etching of Metals. Don M. McCutcheon and William Pahl. *Metal Progress,* v. 56, Nov. 1949, p. 674-679.

The results obtained, particularly for revealing flow lines, indicate that the method can be recommended for special problems where the extra care and time required are justified. Highly alloyed metals, difficult to etch chemically, are especially recommended for cathodic etching.

11-369. Flow Line Structure of Cartridge Brass. L. A. Carlson. *Metal Progress,* v. 56, Nov. 1949, p. 681-684.

During production of 0.50-caliber brass cartridge cases, cracking of some of the cases at the head rim, as they came from the machine which inserted the primer, was noticed. Conventional metallographic methods gave no clues to the cause of the difficulty, hence a new etching procedure was developed to reveal the flow-line structure.

11-370. Three New Etchants for Nonferrous Metals. Charles T. Flachbarth and Chester S. Pondo. *Metal Progress,* v. 56, Nov. 1949, p. 688-691.

Main purpose of the new etchants

is to produce greater contrast in the microstructures of copper and Ni alloys. One of these etchants, called Pondo's reagent, is particularly effective on Cu, alpha brasses, and phosphor bronzes. The second produces good contrast on Ni specimens without the use of an electrolytic bath. It also produces a clear, flat etch with emphasis on the grain boundaries when used on Monel. The other etchant is outstanding for contrast etching of high-Ni alloys, such as Monel or Ni-Span C.

11-371. Ferric Chloride Etchant for Austenite Grain Size of Low-Carbon Steel. O. O. Miller and M. J. Day. *Metal Progress,* v. 56, Nov. 1949, p. 692-695.

Results of a study of about 200 etchants and of austenite grain size of 20 low-carbon steels were used in development of a recommended procedure using 5% ferric chloride. Comparative results for 4 etchants.

11-372. Electropolishing of Steel in Chrome-Acetic Acid Electrolyte. C. E. Morris. *Metal Progress,* v. 56, Nov. 1949, p. 696-699, 710, 712, 714.

A chromic-acetic acid electrolyte of low water content that can be made up without recourse to acetic anhydride. What is believed to be an entirely new method of making electrical contact with the specimens is also described, as well as a somewhat unusual way of agitating the solution during electropolishing. How the procedure is applied to metallographic studies.

11-373. A Direct Method of Determining Preferred Orientation of a Flat Reflection Sample Using a Geiger Counter X-Ray Spectrometer. L. G. Schulz. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1030-1033.

Chief advantage of the method is that the experimental data may be used directly without corrections for changes in geometry during rotation of the sample.

11-374. Determination of Preferred Orientation in Flat Transmission Samples Using a Geiger Counter X-Ray Spectrometer. L. G. Schulz. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1033-1036.

Method employing a diverging X-ray beam. Shows that for a certain range of sample thicknesses, counting rate is independent of rotation of the samples.

11-375. Interferometric Study of Slip Bands on Metal Crystals. S. Tolansky and J. Holden. *Nature,* v. 164, Oct. 29, 1949, p. 754-755.

Use of multiple-beam interference methods to study displacements which appear on the surfaces of metal crystals when strained. Principal advantages are: the detailed contours of displacement steps are clearly revealed; exact evaluation of displacements of only a few Ångström units can be made; owing to a high sensitivity, onset of the slip is shown at a very early stage; and slip with abnormally low loads can be detected. It has been successfully applied to aluminum and tin.

11-376. Preparation of Aluminium Single Crystals With a Definite Orientation. (In English.) T. J. Tiedema. *Acta Crystallographica,* v. 2, Oct. 1949, p. 261-262.

Method for preparation of Al single-crystal wires and plates with any desired orientation, to within 1°.

11-377. Le microscope de phase. (The Phase Microscope.) A. Arnulf. *Revue de Métallurgie,* v. 46, July 1949, p. 457-460; discussion, p. 461-462.

Metallographic uses. Optical arrangements are shown schematically.

11-378. Méthode d'étude des granulations visibles à la surface des métaux soumis à des déformations plastiques. (Method of Study of Visible Irregularities on the Surfaces of Metals Resulting From Plastic Deformation.) J. Hérenguel and M. Scheidecker. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 537-543.

Method consists of study of corrosion patterns and slip lines. Indicates that macroscopic irregularities are related to the microstructure resulting from a series of recrystallizations.

11-379. Cathodic Vacuum Etching of Metals. Don M. McCutcheon and William Pahl. *Steel Processing,* v. 35, Nov. 1949, p. 590-591.

See abstract from *Metal Progress,* item 11-368, 1949.

11-380. An Apparatus for Preparing Small Samples of Pure Iron to Which Fixed Quantities of Impurities Can Be Added. J. D. Fast. *Philips Research Reports,* v. 4, Oct. 1949, p. 370-374.

High-frequency-melting apparatus for preparing alloys of well-defined compositions in quantities up to 2 kg.

11-381. An X-Ray Camera for Obtaining Powder Pictures at High Pressures. A. W. Lawson and N. A. Riley. *Review of Scientific Instruments,* v. 20, Nov. 1949, p. 763-765.

Two methods which have been successfully employed at pressures ranging up to 15,000 atm. In both schemes the sample is enclosed in a small beryllium bomb which serves to retain the pressure but permits

the X-rays to be transmitted to the sample and diffracted to an external recording film. Sample data on cerium illustrate possibilities and limitations of the technique.

11-382. An Apparatus for Measurement of Extremely High Internal Friction. T'ing-Sui Ke and Marc Ross. *Review of Scientific Instruments,* v. 20, Nov. 1949, p. 795-799.

Simple torsion apparatus. Results were compared with torsion-pendulum measurements using the free-decay method. This apparatus can be used at a constant given stress amplitude and constant frequency of vibration. The stress amplitude and frequency of vibration can be varied over a wide range. The feature that measurements can be made while the zero point is changing renders the apparatus useful in the study of internal friction of freshly cold worked metals.

11-383. Preparation of Samples of Active Metals. Donald F. Clifton. *Review of Scientific Instruments,* v. 20, Nov. 1949, p. 830-831.

Preparation of oxide-free samples by working under liquid nitrogen.

11-384. Straumanis' Method of Film-Shrinkage Correction Modified for Use Without High Angle Lines. A. J. C. Wilson. *Review of Scientific Instruments,* v. 20, Nov. 1949, p. 831-832.

Improved X-ray diffraction technique.

11-385. The Application of X-Ray Methods to the Determination of Phase Boundaries in Metallurgical Equilibrium Diagrams. E. A. Owen and D. P. Morris. *Journal of the Institute of Metals,* v. 76, Oct. 1949, p. 145-168.

Recent criticisms shown to be unfounded. Certain objections to the microscopical method. In the light of X-ray investigations carried out on solid specimens, it is concluded that the study can best be conducted with material in powder form. 35 ref.

11-386. X-Ray Line Broadening in Metals. W. H. Hall. *Proceedings of the Physical Society,* v. 62, sec. A, Nov. 1, 1949, p. 741-743.

Diverse theoretical interpretations can be reconciled in terms of the hypothesis that both particle-size and stress effects are present simultaneously.

11-387. Interferometric Examination of Hardness Indentations on Tin. S. Tolansky and D. G. Nickols. *Nature,* v. 164, Nov. 12, 1949, p. 840.

Technique for production of the tin surface in which molten tin is poured onto hot plate glass. Removal of the tin from the glass reveals an "optically perfect" surface. Indentations were made with a microhardness indenter. Interferometry reveals an asymmetric pattern, in contrast to the symmetric pattern on steel, and related to the crystal structure of the tin. Slip or twinning lines are apparent.

11-388. Method of Investigation of Dendrite Heterogeneity of Alloys. (In Russian.) V. M. Tageev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 67, Aug. 1, 1949, p. 675-677.

Method for direct determination of the composition of solid and liquid phases in multi-component systems. A perforated specimen is heated to the temperature of appearance of the liquid phase. This phase runs out of the perforations, and is collected and analyzed.

11-389. Electrolytic Polishing and Short-Circuit Etching of Copper and Cuprous Alloys. M. Jaroszewicz-Bortnowski and J. Schoofs. *Engineers' Digest,* v. 10, Nov. 1949, p. 381-383. Translated and condensed from *Revue Universelle des Mines,* ser. 9, v. 5, May 1949, p. 170-174.

Improved metallographic procedure. Typical results.

11-390. A β-Filter Furnace for Elevated Temperature Single-Crystal X-Ray Diffraction. E. G. Steward. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Nov. 1949, p. 371-372.

An attachment for single-crystal X-ray cameras, enabling photographs to be obtained at elevated temperatures. Heating is accomplished by passing an electric current through a cone of nickel foil (for CuK radiation) which surrounds the specimen. At the same time the cone acts as a β-filter for the diffracted X-rays.

11-391. The Preparation of Beryllium Foil. H. Smith. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Nov. 1949, p. 378-379.

Improved apparatus and technique. Metal is evaporated in high vacuum and condensed on the cooler walls of a Pyrex tube.

11-392. Notes on the Electrolytic Isolation of Carbides in Steel. Gustaf Wranglen. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 919-920.

Theory and literature on thermodynamics, kinetics, and their practical application to the above. 16 ref.

11-393. Carbides in Isothermally Transformed Chromium Steels. Walter Crafts

and John L. Lamont. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 957-967.

Electrolytic extraction of carbides from quenched and tempered steel and their examination under the electron microscope were applied to isothermally transformed steels. A preliminary survey of the utility of the method indicates that it has promising possibilities for investigating the characteristics of pearlite and bainite. Examination of carbon and chromium steels suggests that pearlite is formed with carbides of lamellar and nonlamellar form and that bainite forms with a structure analogous to, but significantly different from, martensite.

11-394. Binary Chart for Interconversions of Mol, Weight, and Volume Percent. John B. Seabrook. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 993-994.

11-395. Metallography of Aluminum Casting Alloys. A. M. Montgomery. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 249-255; discussion, p. 255-256.,

Previously abstracted from *American Foundryman,* item 11-145, 1949.

11-396. Metallography of Cast Magnesium Alloys. P. F. George. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 133-148; discussion, p. 148-149.

Previously abstracted from preprint. See item 11-141, 1949.

11-397. A New Method for Determining Austenitic Grain Size of Cast Steel. E. J. Eckel and S. J. Paprocki. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 392-396; discussion, p. 396-399.

Previously abstracted from preprint. See item 11-140, 1949.

11-398. Sur la détection micrographique de la fragilité de revenu des aciers au carbone faiblement alliés. (Micrographic Detection of Annealing Brittleness in Low-Alloy Carbon Steels.) Pierre A. Jacquet. *Comptes Rendus* (France), v. 229, Oct. 10, 1949, p. 713-715.

Electropolishing method followed by etching with picric acid solution containing surface-active substances for micrographic investigation of grain boundaries of steel made brittle during annealing. Results for two low-alloy steels, differently heat treated, indicate that brittleness is caused by intergranular segregation of carbon. This result was not obtained when the specimens were mechanically polished, because of the surface deformation resulting from the polishing process.

11-399. The Use of Punched Cards in Molecular Structure Determinations. III. Structure-Factor Calculations of X-Ray Crystallography. (In English.) Jerry Donohue and Verner Schomaker. *Acta Crystallographica,* v. 2, Dec. 1949, p. 344-347.

Method using IBM machines.

11-400. An Improved Punched-Card Method for Crystal Structure-Factor Calculations. (In English.) M. D. Grems and J. S. Kasper. *Acta Crystallographica,* v. 2, Dec. 1949, p. 347-351.

Method using IBM machines.

SECTION XII

INSPECTION and STANDARDIZATION

12-1. An Investigation of Radiography in the Range from 0.5 to 2.5 Million Volts. W. W. Buechner and others. *ASTM Bulletin,* Dec. 1948, p. 54-64.

Deals with work begun in the summer of 1941 at MIT for the NDRC and Navy Dept. Radiography made it possible to examine the interiors of a variety of heavy explosive weapons, for improvement of our own weapons and determination of the characteristics of captured enemy weapons. Production, absorption, and scattering; application methods; and techniques of high-voltage radiography.

12-2. The Growing Importance of Statistical Methods in Industry. P. L. Alger. *General Electric Review,* v. 51, Dec. 1948, p. 11-17.

Discussion is correlated with a review of the literature. 44 ref.

12-3. How to Make Best Use of Gage Block Accessories. H. J. Chamberland. *Iron Age,* v. 162, Dec. 23, 1948, p. 52-56.

Use of such accessories as the sine bar, surface plates, master flats, master squares, base blocks, adjustable holders, caliper bars, trammel points, and similar items. Advantages, limitations, typical applications, and accuracies.

12-4. Radiography as a Foundry Tool. J. B. Caine. *Foundry,* v. 77, Jan. 1949, p. 68-69, 180-181, 184, 186.

Attempts to debunk the belief of the "average foundryman" that radiography is too expensive and also too sensitive in that it will cause rejection of castings otherwise perfectly acceptable. How radiography can best be applied in the average foundry.

12-5. Lamination Detection; Routine Examination of Aluminium Sheet by Ultrasonic Radiation. H. R. Clayton and N. D. G. Mountford. *Metal Industry,* v. 73, Dec. 3, 1948, p. 443-447.

Apparatus designed for the detection of laminations in aluminum sheet under production conditions.

12-6. Quality Control; An Ultra-Simplified Method of Chart-Construction and Use. H. Howell. *Aircraft Production,* v. 10, Dec. 1948, p. 404-405.

The method described eliminates the customary arithmetic without affecting statistical precision. It is simply that of tabulating for ready reference pre-calculated values of all the required statistical data. Illustrated by a typical example.

12-7. A Discussion of Modern Quality Control Techniques. C. W. Kennedy. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 47-A-65, 1947, 21 pages.

12-8. Testing and Inspection of Wire Ropes. James Gee. *Mine & Quarry Engineering,* v. 14, Dec. 1948, p. 375.

Use of the Cyclograph, which combines application of tension with magnetic analysis.

12-9. Zerstorungsfreie Werkstuckprufung. (Non-Destructive Methods of Testing Materials.) F. Rohner. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 289-293.

X-ray, electrical, magnetic, and ultrasonic methods.

12-10. Evaluating Quality With the "Standard Deviation". Clifford W. Kennedy. *Tool Engineer,* v. 22, Jan. 1949, p. 26-28.

Statistical procedures, illustrated by application to a particular part.

12-11. Inspection With Ultrasonic Waves. A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 29-32.

Procedures and equipment.

12-12. Why Taper Threads Don't Fit. W. E. Burndrett. *American Machinist,* v. 93, Jan. 13, 1949, p. 95-99.

From years of experience with rotary tool joints, the author says that accurate gages do not insure interchangeable pins and boxes. While offering no solution, he does

outline possible errors in taper-threaded products.

12-13. Quality Control in the Manufacture of Basic Steels. Hubert C. Swett. *American Iron and Steel Institute,* 1948, 9 pages.

Procedures of Bethlehem Pacific for products varying from ordinary merchant-bar quality to products requiring very carefully controlled properties for specific uses.

12-14. The Standardization and Simplification of Steel Products. J. G. Morrow and L. H. Winkler. *American Iron and Steel Institute,* 1948, 19 pages.

Development of standards, including what was accomplished during World War II. Savings thus made possible.

12-15. Non-Destructive Testing and Its Place in the Current and Prospective Navy Programs. R. H. Lambert. *Non-Destructive Testing,* v. 7, Fall 1948, p. 20-21.

12-16. Non-Destructive Testing of Drill Pipe. Robert C. McMaster. *Non-Destructive Testing,* v. 7, Fall 1948, p. 27-33.

Causes of drill-pipe failures, recommended drilling techniques and inspection procedures, typical defects and frequency of their occurrence, and economics of drill-string inspection. 26 ref.

12-17. Remarks on the Precision of the Optical Spherometer. Bohumil Jurek. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 215-221. Translated from the French.

Experimental and theoretical study of precision of the above instrument for measurement of the radius of curvature of spherical surfaces.

12-18. Gauging of Precision Screw Threads—Internal Threads. A. C. Pruliere. *Microtecnic* (English Edition), v. 11, Oct. 1948, p. 222-228. Translated from the French.

The various instruments and techniques for inspection and measurement, their advantages and disadvantages. (To be continued.)

12-19. High Standard of Production Attained With Statistical Quality Control. Julian K. Miller. *Production Engineering & Management,* v. 23, Jan. 1949, p. 45-48.

Applications at Reo Motors, Inc.

12-20. (Book). **Precision Measurement.** Jack Johnson. 181 pages. Pitman Publishing Corp., 2 West 45th St., New York 19, N. Y. $3.00.

Mathematical calculations for checking precision inspection of complex parts. Problems are carried through step by step, and cover checking of tapers, dovetail angles, relief on dies, the two- and three-wire method of checking threads, measuring radii, locating holes for index plates, and many other jobs.

12-21. Air-Electric Gaging Automobile Engine Components. A. H. Allen. *Steel,* v. 124, Jan. 24, 1949, p. 56-58, 82.

Cylinder blocks, heads, pistons, piston pins, connecting rods, crankshafts and camshafts are among the parts checked by new types of automatic gaging equipment.

12-22. Defects in Steel; Some Methods of Obtaining Permanent Records. H. Thompson. *Iron and Steel,* v. 22, Jan. 1949, p. 5-7.

The photographic method; reflex printing; ink prints; sulfur prints; sulfur-print reproduction; crack prints; oxide printing; phosphorus printing; lead prints; nickel prints; and magnetodefectograms. 10 ref.

12-23. Quality Control Review—Summarize Test Procedures for Steel Foundrymen. John W. Juppenlatz. *American Foundryman,* v. 15, Jan. 1949, p. 38-48.

12-24. Standard Tests for Bolts and Nuts. W. N. Boyd. *Fasteners,* v. 5, no. 3, [1948], p. 7-9.

Tests developed by American Institute of Bolt, Nut and Rivet Manufacturers.

12-25. Are the H-Steels Being Accepted? T. C. Du Mond. *Materials & Methods,* v. 29, Jan. 1949, p. 67-69.

Present status of acceptance. Buying and using steels specified according to hardenability limits seems to prove satisfactory from all viewpoints.

12-26. Influence des dimensions de la cristallisation sur la propagation des ultra-sons dans les métaux. (Influence of Crystal Dimensions on the Propagation of Ultrasonic Vibrations in Metals.) Paul Bastien, Jacques Bleton, and Emmanuel de Kerverseau. *Comptes Rendus* (France), v. 227, Oct. 11, 1948, p. 726-728.

Certain anomalies, observed during use of the above for detection of defects, are believed to be produced by vibration of individual crystals, which resonate, thus producing ultrasonic vibrations of their own.

12-27. Ultrasonic Flaw Detector. *Electronics,* v. 22, Feb. 1949, p. 124.

Whereas X-ray is practical only for metal thicknesses up to about 6 in., the technique outlined tests solid metal from 0.25 in. to 30 ft. in thickness.

12-28. Bibliography on Industrial Radiology, 1945-1948. Herbert R. Isenburger. *St. John X-Ray Laboratory,*

Califon, N. J., 1948, 15 pages.

This mimeographed listing contains 333 additional references. It is the 2nd supplement to "Industrial Radiology." Ed. 2, 1943, John Wiley & Sons, New York. The first supplement was published in 1945.

12-29. Oldsmobile Uses Modern Gaging Techniques in Producing New Engine. Herbert Chase. *Iron Age,* v. 163, Feb. 10, 1949, p. 78-82.

12-30. Magnetic Particle Testing. L. B. Jones. *American Society of Mechanical Engineers,* Paper No. 48-A-79, 1948, 12 pages.

Method for detecting cracks, discontinuities, and other defects in magnetic material by the application of magnetic forces and paramagnetic particles. 53 ref.

12-31. Roller Stock Gage That Increases Die Accuracy. Roger Isetts. *Machinery* (American), v. 55, Feb. 1949, p. 201-202.

12-32. British Radiographic Lab. A. Wilson. *Welding Engineer,* v. 34, Feb. 1949, p. 46-48.

Laboratory of British Admiralty and its application to weld radiography.

12-33. Comparative Magnesium-Alloy Specifications. *Welding Engineer,* v. 34, Feb. 1949, p. 65.

A table.

12-34. Selection of Measuring Rolls for 30-Degree Involute Splines. Joseph Silvagi. *Tool Engineer,* v. 22, Feb. 1949, p. 26-28.

Use of cylindrical measuring rolls for gaging gears and splines. Method of determining the correct size of rolls for use in a given application.

12-35. Fluorescent Liquid Inspection. Ray McBrian. *American Society of Mechanical Engineers,* Paper No. 48-A-80, 1948, 4 pages.

Use of Magnaglo and Zyglo for railroad prime-mover axles and for various engine parts.

12-36. Statistical Inspection Pictures Cut Material Procurement Costs. Dorian Shainin. *American Society of Mechanical Engineers,* Paper No. 48-A-88, 1948, 11 pages.

Mechanics of the "Lot Plot" sampling inspection plan.

12-37. (Book). **A.S.T.M. Standards on Copper and Copper Alloys.** Rev. ed. 504 pages. 1948. American Society for Testing Materials, 1916 Race St., Philadelphia, Pa. $4.35.

All the society's specifications relating to copper and copper alloys are included.

12-38. Gauging of Precision Screw Threads—Internal Threads. A. C. Pruliere. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 234-240. Translated from the French.

General principles. Procedures and equipment.

12-39. Workpiece Inspection in Modern Mass Production. H. Kieffer. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 263-266. Translated from the French.

Recommended methods and inspection devices.

12-40. The Mu-Adjustable Cylindrical Plug Gauge. Carl Weiland. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 275-276. Translated from the German.

Gage for measuring internal diameters.

12-41. Central Inspection Department Solves Daily Production Problems at Hunter Spring. *Steel,* v. 124, Feb. 21, 1949, p. 123-124.

12-42. Rotary Files and Burs. *American Machinist,* v. 93, Feb. 24, 1949, p. 129, 131.

Standard types and standard dimensions.

12-43. Transition Problems in Producing the Unified Screw Thread. William Boyd. *Iron Age,* v. 163, Feb. 24, 1949, p. 66-71.

Conversion is expected to cost the industry about $3 million and take up to 5 yrs. Changes in production facilities and gaging and inspection; do's and don't's in making the change; and the new fits.

12-44. Law of Failure of Stresscoat. A. J. Durelli and T. N. DeWolf. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, No. 2, 1948, p. 68-83.

In interpreting results of brittle coating experiments, it is generally accepted that Stresscoat breaks when the maximum tensile strain exceeds a critical value. Demonstrates two extreme cases: singular point and pure compression, where this law does not apply. Five particular cases were studied experimentally.

12-45. "H" Steels; Chemical Composition Ranges. *Metal Progress,* v. 55, Feb. 1949, p. 184B.

A tabulation.

12-46. Weld Testing by Ultrasonic Methods. G. Konried and A. C. Rankin. *Welding,* v. 17, Feb. 1949, p. 48-57.

Comparative study of different techniques.

12-47. Checking Thread Pitch Diameter Runout. *Iron Age,* v. 163, Mar. 3, 1949, p. 95.

Simple but quite effective method of checking the above.

12-48. A New, Fast Method of Inspecting Airfoil Contours of Blades. Edward C. Polidor. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 111-117.

New "Pant-O-Scriber" blade-checking machine designed as a fast, economical method of checking blades, forging dies, master patterns, and cast or forged blades.

12-49. Statistical Methods Double Quality Control Efficiency. S. E. Peters. *Factory Management and Maintenance,* v. 107, Mar. 1949, p. 84-86.

Use by Dunmore Co., Racine, Wis.

12-50. How Steel Producers View Steel Compositions and Specifications. Charles M. Parker. *Steel,* v. 124, Mar. 14, 1949, p. 91-96, 98.

Improperly used words such as "quality," "grade," "type," and "kind" are sometimes the cause of additional unnecessary expense. Definitions of terms; influence of current raw materials problems on steel compositions; six common methods of specifying steels.

12-51. Operation of Statistical Quality Control in a Steel Mill. W. T. Rogers. *Steel,* v. 124, Mar. 14, 1949, p. 102, 105, 108, 111, 114, 117, 120, 122.

Statistical methods used and illustration of each.

12-52. Etat actual de la normalisation et des méthodes de controle des états de surface en suede. (Present Position of Standardization and Methods for Control of Surface Condition in Sweden.) Karl Wessel. *Journées des Etats de Surface,* 1946, p. 144-148; discussion, p. 148.

12-53. Inspection Moves Ahead. William A. Ormondroyd. *Tool Engineer,* v. 22, Mar. 1949, p. 35-36.

Recent equipment developments.

12-54. The Supersonic Reflectoscope. Ralph H. Frank and Robert W. Renner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 299-304; discussion, p. 304-306.

Applications in the testing of steel.

12-55. Electronic Gauges. (Continued.) Jean Schwartz. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 267-274. Translated from the French.

Description and methods of use. Begins descriptions of some complete measuring systems. (To be continued.)

12-56. Die Verwendung von Bleifiltern bei der Röntgendurchstrahlung von Stahl mit Röhrenspannungen von 100 bis 220 kv. (The Use of Lead Filters for X-Ray Investigation of Steel With Tube Voltages of 100 to 220 KV.) Ernst A. W. Muller. *Stahl und Eisen,* v. 68, July 15, 1948, p. 277.

Customary X-ray diagrams are subject to error in that they fail to account for the thickness of the material. This defect is corrected by lead filters. Relation of the steel thickness to filter thickness.

12-57. (Book.) **A.S.T.M. Specifications for Steel Piping Materials.** 319 pages. Dec. 1948. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Covers pipe, tubes, castings, forgings, and bolting.

12-58. Continuous Gaging Determines Average Stock Thickness. A. C. Sanford. *American Machinist,* v. 93, Mar. 24, 1949, p. 100-103.

By overlooking local bumps and surface depressions in moving sheet stock, continuous gages indicate average thickness and trends in dimensional changes.

12-59. X-Ray Examination of Materials and Application to Shipyard Welding. T. J. Heal. *Research,* v. 2, Mar. 1949, p. 119-126.

Fundamental principles of radiography, and above applications.

12-60. The Statistical Analysis of Experimental Data. B. Saravanos. *Aircraft Engineering,* v. 21, Mar. 1949, p. 64-70, 75.

New approach employing a graphical method for investigating nonnormal frequency distributions.

12-61. Economic Aspects of Standardization. F. E. Powell. *Standards World,* v. 1, Spring 1949, p. 59-76.

A general discussion of advantages.

12-62. Cartridge Case Inspection by Reflectogage. Fred M. Arnold. *Metal Progress,* v. 55, Mar. 1949, p. 320-323.

Use of the Reflectogage—an inspection instrument based on use of high-frequency sound waves, to detect defects in brass cartridge cases. The defect consisted of internal ruptures in the head parallel to the base.

12-63. Diversified Techniques Involved in Multipurpose Quality Control. O. W. Hitchcock. *Steel,* v. 124, Apr. 4, 1949, p. 98-101, 128.

Statistical and other methods used to control manufacture of high-precision aircraft parts. Said to be applicable to almost any metal product made under ordinary or unusually severe specifications.

12-64. How to Avoid Rejects on Large Interchangeable Parts. N. N. Sawin.

American Machinist, v. 93, Apr. 7, 1949, p. 98-100.

Recommendations as to working dimensions, measuring techniques, and clamping methods.

12-65. Comparator Accessories Speed Inspection. Herbert Chase. *American Machinist,* v. 93, Apr. 7, 1949, p. 110-111.

With an adjustable fixture base applied to the tables of bench-type Jones & Lamson comparators it is possible to position the fixture exactly where desired in relation to the lens system of the comparator.

12-66. Quality Control in Tin Plate Production. Harry C. Morrow. *Instrumentation,* v. 3, 1st qtr. 1949, p. 8-11.

Methods and equipment, including annealing; hot-dip and electrolytic plating; preliminary surface treatment; inspection; and shearing. Control systems are diagrammed.

12-67. Electronic Gauges. (Concluded.) Jean Schwartz. *Microtecnic* (English Edition), v. 3, Jan.-Feb. 1949, p. 10-18. Translated from the French.

Some complete systems. 44 ref.

12-68. Workpiece Inspection in Modern Mass Production. H. Kieffer. *Microtecnic* (English Edition), v. 3, Jan.-Feb. 1949, p. 38-41. Translated from the French.

Organization, procedures, and equipment of inspection departments for checking quality of metal equipment and parts.

12-69. The Standardization and Simplification of Steel Products. L. H. Winkler and J. G. Morrow. *ASTM Bulletin,* Mar. 1949, p. 20-22. A condensation.

While the scope of the discussion is specifically steel products, many of the comments and much of the information is applicable to other materials.

12-70. The Consumer Looks at Steel Specifications. Part I. Muir L. Frey. *Steel Processing,* v. 35, Mar. 1949, p. 137-142. A condensation.

Development of SAE and AISI specifications, discussing the many solved and unsolved problems involved. Believes that the number of standard grades is still excessive. (To be continued.)

12-71. Measurement of Close Tolerance Parts. *Materials & Methods,* v. 29, Apr. 1949, p. 79, 81.

Thermal-expansion corrections to be used when measuring parts made from plain carbon and low alloy steels, Al and Al alloys, brass, and bronze.

12-72. Turbine-Blade Checking. *Aircraft Production,* v. 11, Apr. 1949, p. 115.

Optical instrument especially suitable for work necessitating frequent changes in blade profiles.

12-73. Simplifying Quality Control. F. H. Wells. *Electrical Manufacturing,* v. 43, Apr. 1949, p. 112-113, 198, 200.

How probability paper can be used for design development and routine testing both to measure quality level and draw attention to variations in quality that need correction.

12-74. Steel Specifications . . . As Seen by Producers . . . As Seen by Consumers. *SAE Journal,* v. 57, Apr. 1949, p. 36-39. Based on two papers: "Steel Compositions and Specifications From the Steel Producer's Viewpoint," Charles M. Parker; and "The Consumer Looks at Steel Specifications," Muir L. Frey.

Advantages and disadvantages of existing methods from the two viewpoints. Recommendations.

12-75. Tube Quality Control. Milton Schor. *Modern Packaging,* v. 22, Apr. 1949, p. 187-189.

New methods of assuring that enamel, cap, and coating of collapsible tubes will be compatible with product and use.

12-76. Standard Specifications for Elevated Steel Water Tanks, Standpipes and Reservoirs. *Journal American Water Works Association,* v. 41, Apr. 1949, p. 357-396.

Approved specifications of American Water Works Association, American Welding Society, and New England Water Works Association.

12-77. Code Inspection on Welded Pressure Vessels. Floyd F. Johnson. *Welding Journal,* v. 28, Apr. 1949, p. 364.

12-78. Electronic Thickness Gage Reduces Amount of Off-Gage Steel. *Steel,* v. 124, Apr. 25, 1949, p. 83-84.

Gage does not touch material, eliminating marring; is applicable to other materials in strip or sheet form; and gives continuous reading regardless of rate of movement.

12-79. Comparative Tool Steel Brands. *Iron Age,* v. 163, Apr. 28, 1948, p. 85-86.

A tabular compilation of comparable toolsteel trade names, brought together under ASM class and alloy class.

12-80. Nondestructive Testing Laboratory. *Electronics,* v. 22, May 1949, p. 154, 156, 158.

Equipment of new Naval Ordnance Laboratory—reputed to be the most complete laboratory of X-ray

and other nondestructive testing apparatus in the world.

12-81. The Consumer Looks at Steel Specifications. Part II. Muir L. Frey. *Steel Processing,* v. 35, Apr. 1949, p. 200-201, 208-210.

Availability of steels, method of ordering, hardenability bands, and H-steels.

12-82. Streamlined Specifications: Metals. Ben John Small. *Progressive Architecture,* v. 30, May 1949, p. 92-95.

General requirements, materials, gages, and treatments of structural steel, steel joists, miscellaneous metals, ornamental metals, metal specialties, and hollow metals used by architects.

12-83. How Costs Can Be Cut by Properly Timed Inspection. James L. Erickson. *Production Engineering & Management,* v. 23, May 1949, p. 45-48.

Process inspection is divided into sub-inspection stations and the duties of each.

12-84. Recording Gage for Control of Quality at the Machine. C. W. Kennedy. *Factory Management and Maintenance,* v. 107, May 1949, p. 115-117.

Automatically records measurements on continuous tape marked with statistical control limits.

12-85. Special Inspection Fixture for Precision Forgings. *Tool & Die Journal,* v. 15, May 1949, p. 56, 58.

Used to check golf-club heads.

12-86. Rigid Inspection Precedes Successful Broaching. *Tool & Die Journal,* v. 15, May 1949, p. 66, 68.

Examples showing need for careful checking of broach design and metallurgical specifications. Inspection equipment.

12-87. Ultrasonic Weld Inspection. John C. Smack. *Welding Engineer,* v. 34, May 1949, p. 17-20.

Recent improvements which adapt the "reflectoscope" to weld inspection. Ultrasonic vibrations are projected through the plate at an angle by successive reflections and returned when a defect is encountered.

12-88. The Amount of Inspection as a Function of Control of Quality. G. R. Gause. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 886-893; discussion, p. 894-895.

Simple summaries of inspection results obtained on samples from prior lots of product afford the necessary measures of the degree to which quality of that particular product is controlled and can be used to determine when the amount of inspection should be reduced or increased.

12-89. Magnetic and Inductive Non-Destructive Testing of Metals. I. R. Robinson. *Metal Treatment and Drop Forging,* v. 16, Spring 1949, p. 12-24.

Various techniques. 83 ref.

12-90. The Inspection and Testing of Die Castings. H. K. Barton. *Machinery* (London), v. 74, Apr. 28, 1949, p. 550-554.

Various procedures.

12-91. The Classification Societies and Aluminium Alloys. R. B. Shepheard. *Engineering,* v. 167, Apr. 22, 1949, p. 384. A condensation.

British Al-alloy specifications indicating types suitable for various marine applications.

12-92. How the New Thread Standard Affects You. Herman H. Lind. *Fasteners,* v. 5, no. 4, [1949], p. 7-9.

Answers questions about the above. Class 2A and 2B tolerances, allowance, and crest clearances.

12-93. Control and Inspection for Quality Welds. J. Lyell Wilson. *Welding Journal,* v. 28, May 1949, p. 443-452.

Proved inspection methods and ideas surrounding their application in shipbuilding, pressure vessels, and piping described and illustrated. Macrographs of failed or defective welds. 24 ref.

12-94. Prolonging Copper-Tungsten Electrode Tip Life. D. J. Rahn. *Welding Journal,* v. 28, May 1949, p. 453-455.

Careful control in manufacture of resistance-welding electrodes and their inspection by the purchaser insure better service and longer tip life. Recommendations for grain structure. Recommended use techniques.

12-95. Gamma Ray Radiography of Drag-Type Rotary Drill-Bit Blades. J. M. Williams. *Oil and Gas Journal,* v. 48, May 12, 1949, p. 80-81.

Procedures and results.

12-96. Acme-Thread Measurement With Wires. J. S. Rojahn. *American Machinist,* v. 93, May 19, 1949, p. 145.

Calculations for measurement of pitch diameter.

12-97. (Book) **SAE Iron and Steel Standards and Specifications. 1948.** Society of Automotive Engineers, Inc., 29 West 39th St., New York 18, N. Y. (Special Publication No. 30.) Reprint from SAE Handbook, 1948, p. 285-406. $3.00, nonmembers; $1.50, members.

12-98. (Book) **SAE Non-Ferrous Metals, Standards and Specifications. 1948.** Society of Automotive Engineers, Inc., 29 West 39th St., New York 18, N. Y. Reprint from SAE Handbook, 1947, p. 401-492.

12-99. Steel Compositions and Specifications From the Steel Producers Viewpoint. Charles M. Parker. *Blast Furnace and Steel Plant*, v. 37, May 1949, p. 553-557.

Abstracted from *Steel*, item 12-50, 1949.

12-100. Ultrasonic Testing of Tool Steels. James C. Hartley and Edgar K. Mull. *Iron Age*, v. 163, May 19, 1949, p. 80-85.

Results of an investigation which demonstrated the ability of ultrasonic testing to delineate segregation in high-speed steels and which indicated that the Reflectoscope can differentiate between mechanical defects and segregation. The feasibility of checking heat treatments by successive reflection counts.

12-101. Gaging 125 Valve Tappets Per Minute. Herbert Chase. *Iron Age*, v. 163, May 26, 1949, p. 66-69.

Coupled to the high-speed manufacturing set-up for valve push-rod bodies, described in the Feb. 3 issue, automatic gaging equipment keeps pace with production. Dome hardness of the tappet is checked along with squareness of the top, three diameters, and length.

12-102. Metallurgical Inspection of Castings. R. R. Senz. *Foundry*, v. 77, June 1949, p. 82-83, 246-248.

Destructive and nondestructive methods.

12-103. Standards of Length and Angle for Precision Engineering. H. Barrell. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 182-190.

Practical standards. Some methods and equipment used for relating the highest qualities of such standards to fundamental bases of linear and angular measurement. Angle standards of wedge and polygonal-block form, together with methods of self calibration, using an autocollimating telescope.

12-104. Uber Glasmesslehren. (Concerning Glass Gages.) V. Hruba. *Transactions, Instruments and Measurements Conference (Stockholm)*, 1947, p. 194-202.

Use of glass instead of metal as material for precision fixed gages is said to be feasible. Advantages and different types. Methods of production.

12-105. A Comparator for High-Precision Measurements of Angles by the Interferometric Method. G. Cassinis. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 191-193.

New method based on an interferometric comparator of special design fitted with a set of angular gage blocks. By wringing together a few such blocks it is possible to get all angular values within a quadrant, and, in addition, values which are supplementary to the former, in steps of one second of arc.

12-106. Ein elektrisches Feinmessverfahren fur Bohrungen. (An Electrical Micro Method for Measuring Internal Diameters.) K. Potthoff and F. Keser. *Zeitschrift fur Angewandte Physik*, v. 1, Mar. 1948, p. 61-66.

Instrument for measuring inside diameters to an accuracy of $\pm 0.2\mu$.

12-107. Use of Fluorescent Intensifying Screens in Million-Volt Radiography. G. M. Corney. *Non-Destructive Testing*. v. 7, Winter 1948-1949, p. 17-19.

Properties of screens and use in industry.

12-108. Fluoroscopic Inspection of Aluminum and Magnesium Castings. I. L. R. Curtis. *Non-Destructive Testing*, v. 7, Winter 1948-1949, p. 25-30.

Construction, calibration, and use of the fluoroscope. (To be continued.)

12-109. Detection of Incipient Drill Pipe Failure; Corrosion Fatigue Is Drill Pipe Enemy No. 1. Walter C. Main. *Drilling*, v. 10, June 1949, p. 63-64.

Mechanical caliper and gage tests, luminous-energy tests, magnetic-field tests, and their limitations.

12-110. How the New Thread Standard Affects You. Herman H. Lind. *Modern Machine Shop*, v. 22, June 1949, p. 146-148, 150, 152, 154.

12-111. Flaw Detection by Ultrasonic and Other Non-Destructive Methods. A. C. Rankin. *Journal of the West of Scotland Iron and Steel Institute*, v. 55, 1947-48, p. 69-114; discussion, p. 114-118.

Attention is primarily focused upon ultrasonic flaw detection, radiography, and magnetic crack detection. Principles, practical use, and operation of each. Relationships between the range of application of various tests. 12 ref.

12-112. Basic Interpretation of X-Ray Photographs of Pipe-Line Field Welding. R. R. Hughes. *Oil and Gas Journal*, v. 48, June 2, 1949, p. 55-57, 66.

How flaws were detected in welding big-inch pipe under actual construction. X-ray film interpretations and typical case histories.

12-113. High Speed Cine-Radiography.

C. M. Slack, L. F. Ehrke, D. C. Dickson, and C. T. Zavales, *Non-Destructive Testing,* v. 7, Spring 1949, p. 7-11, 23.

Equipment and procedure for various applications.

12-114. A Nomogram for Computing Geometrical Unsharpness in Industrial Radiographs. Herman E. Seemann. *Non-Destructive Testing,* v. 7, Spring 1949, p. 12-15.

Factors which affect visibility of detail. Tests for determining the upper limit for geometrical unsharpness and a nomogram which may be used as a substitute for computing.

12-115. Microradiography. Rudolph Pospisil. *Non-Destructive Testing,* v. 7, Spring 1949, p. 16-18.

Reflection method.

12-116. Fluoroscopic Inspection of Aluminum and Magnesium Castings. L. R. Curtis. *Non-Destructive Testing,* v. 7, Spring 1949, p. 24-27.

Procedure and results of expediting production inspection by use of a front-surface mirror and of the inspection of 20,000 aircraft castings.

12-117. Non-Contacting X-Ray Thickness Gages. H. S. Maxwell and C. W. Clapp. *Iron and Steel Engineer,* v. 26, May 1949, p. 70-74; discussion, p. 74-75.

Details of construction, operation, and advantages of above method for continuously gaging the thickness of hot rolled strip during production.

12-118. Stainless Steel Fasteners Normally Stocked. *American Machinist,* v. 93, June 2, 1949, p. 131.

12-119. Report of Committee B-6 on Die-Cast Metals and Alloys. *American Society for Testing Materials,* Preprint 13, 1949, 4 pages.

Includes proposed tentative specifications for zinc-base alloys in ingot form for die castings.

12-120. Important New and Revised Standards on Steel, Paint and Paint Materials, Plastics, and Non-Ferrous Metals. *ASTM Bulletin,* May 1949, p. 22-24.

12-121. Steel Products Manual. Sec. 1. Pig Iron and Blast Furnace Ferroalloys. Sec. 2. Semifinished Carbon Steel Products for Forging. Sec. 8. Hot Rolled Carbon Steel Bars. Sec. 10. Hot Rolled Alloy Steels. *American Iron and Steel Institute,* 1949. 22, 53, 91, and 111 pages.

Four of a series of paper-bound booklets punched for looseleaf binding. Standard grades, identification, testing, analysis, manufacturing procedures, metallurgical aspects, quality control, specifications.

12-122. Basic Problems in Construction of Devices for Control of Dimensions in the Machine-Tool Industry. (In Russian.) I. E. Gorodetskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan 1949, p. 16-18.

Various factors involved in the above. Different types of equipment and their combinations, as well as their applications to various cases.

12-123. Magnetic Method for Investigation of Steel Cables for Control of Their Quality. (In Russian.) V. S. Kravchenko. *Izvestiya Akademii Nauk, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Feb. 1949, p. 283-291.

12-124. Application of Luminescent "Defectoscope" for Production Control. (In Russian.) M. Ya. Fuks. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 295-298.

Application of apparatus to detection of defects in nonferromagnetic-steel, light-alloy, and ceramic products. Details of method and its wide applicability.

12-125. Zerstörungsfreie Werkstoffprufung nach dem Magnetpulververfahren. II. Anwendung im Maschinen- und Motorenbau. (Nondestructive Testing of Materials by the Magnetic Powder Process. II. Its Use in the Construction of Machines and Motors.) E. A. W. Muller. *Archiv fur Technisches Messen,* Jan. 1949, p. T8-T10 (6 pages).

Use for detecting fatigue, grinding, and heat treatment cracks; slag inclusions, rolling defects. Instruments used. 16 ref.

12-126. (Book) **Proceedings of Fastener Manufacturers' Symposium.** 100 pages. American Institute of Bolt, Nut and Rivet Manufacturers, Hanna Bldg., Cleveland, O. $1.50.

Contains 13 papers regarding the American-British-Canadian unified screw threads. Historical background of the agreement, the new standards, and effects on fastener manufacture.

12-127. (Book) **Engineering Tolerances.** H. G. Conway. 286 pages. 1948. Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W. C. 2, London, England. 30s.

Divided into three main parts: theory and practice; standard systems; miscellaneous production problems. The first part covers the fundamental theories of tolerance units, gaging and measurement, instrumentation, transition fits, oversize and undersize tools, press fits.

Among standard systems described are manufacturing and installation limits for antifriction bearings, sintered bearings, oil seals. Under miscellaneous production problems such matters as rolling, stamping, drawing, extrusion, casting, plastic and rubber molding are discussed.

12-128. Field Experience on Gamma Ray Inspection of Welds in a High Pressure Pipe Line. A. B. Lauderbaugh and S. A. Brosky. *American Gas Association, Proceedings,* 1948, p. 368-371.

On a 130-mile 14" pipe line. Procedure and expense.

12-129. Report of Committee A-1 on Steel. *American Society for Testing Materials,* Preprint 1, 1949, 26 pages.

Major and minor suggested changes in specifications. Among the former are those for Si-Mn, Cr-V, and carbon-steel bars for springs; and for cold-rolled carbon-steel strip.

12-130. Report of Committee B-4 on Electrical Heating, Resistance and Related Alloys. *American Society for Testing Materials,* Preprint 11, 1949, 6 pages.

Miscellaneous recommendations and method for testing melts of cathode nickel in order to determine whether they are suitable for use in the production of electronic tubes.

12-131. Report of Committee B-5 on Copper and Copper Alloys, Cast and Wrought. *American Society for Testing Materials,* Preprint 12, 1949, 34 pages.

Miscellaneous recommendations for changes in specifications and test methods. Revised method for preparation of tension-test specimens for Cu-base alloys for sand castings.

12-132. Report of Committee B-7 on Light Metals and Alloys, Cast and Wrought. *American Society for Testing Materials,* Preprint 14, 1949, 13 pages.

Recommendations for changes in specifications and test methods.

12-133. Development of Pressure-Vessel Codes. Elmer O. Bergman. *Welding Journal,* v. 28, June 1949, p. 523-525.

Preparation, revision, and interpretation of codes for construction of unfired pressure vessels. Provisions of the API-ASME code.

12-134. Testing Cathode Materials in Factory Production. J. T. Acker. *Proceedings of the I.R.E.,* v. 37, June 1949, p. 688-690.

Work of an ASTM subcommittee which has been devoted to development of a standard melt of cathode nickel for use in rating new melts by all tube manufacturers, and to establishment of standard test methods.

12-135. How to Get Your Money's Worth Out of Dial Indicators. I. A. Hunt. *American Machinist,* v. 93, June 16, 1949, p. 93-100.

Construction, maintenance, checking, mounting, and use.

12-136. Russian Standard for Cold-Drawn Wire. *Wire Industry,* v. 16, June 1949, p. 506.

Stand diameters and tolerance for 0.004-0.625 in. round wire.

12-137. Non-Destructive Testing of Mining and Other Engineering Components. A. C. Rankin. *Colliery Guardian,* v. 178, June 9, 1949, p. 776-779. A condensation.

Methods suitable for detecting surface and internal flaws, as well as other nondestructive tests.

12-138. Ultrasonic Testing of Aircraft Components. William C. Hitt. *Iron Age,* v. 163, June 23, 1949, p. 66-70.

Practical work done at Douglas Aircraft, including some interesting variations on ultrasonic equipment usage.

12-139. Nondestructive Flaw Detection. D. M. Kelman. *Westinghouse Engineer,* v. 9, July 1949, p. 115-118.

Methods, equipment, and applications.

12-140. Report of Committee E-7 on Non-Destructive Testing. *American Society for Testing Materials,* Preprint 76, 1949, 4 pages.

Includes proposed revised terminology for use in radiographic inspection of castings and weldments.

12-141. Some Problems in the Sampling of Bulk Materials. Louis Tanner and W. Edwards Deming. *American Society for Testing Materials,* Preprint 80, 1949, 6 pages.

Statistical theories are applied in the development of procedures for sampling sugar, tobacco, and wool, but have wide applicability.

12-142. Proving Ground for Quality. Arthur P. Schulze. *Products Finishing,* v. 13, July 1949, p. 28-34, 36.

The standards program of the Steel Kitchen Cabinet Institute. Tests on cabinet finishes.

12-143. Railroad X-Ray Laboratory. *Railway Mechanical Engineer,* v. 123, July 1949, p. 396-400.

Pennsylvania's installation at Altoona; case histories; problem of education.

12-144. Steel Products Manual. (Revised.) Sec. 14. **Tin Mill Products.** Sec.

15. **Hot Rolled Carbon Steel Wire Rods.** *American Iron and Steel Institute,* June 1949, 75 and 62 pages.

Two of series describing metallurgical aspects, manufacturing processes, specifications, and test methods.

12-145. Ultrasonic Inspection. *Metal Progress,* v. 56, July 1949, p. 114. Translated and condensed from "Application of Ultrasonics in Engineering and Physics", S. Ya. Sokolov, *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1328-1335.

Previously abstracted from original, item 11-34, 1949.

12-146. Quality Control Review: Summarize Test Procedures for Malleable Foundrymen. M. O. Booth. *American Foundryman,* v. 16, July 1949, p. 56-58.

One of a series of papers presented at Lecture Course Sessions of 52nd annual AFS meeting.

12-147. Ultramodern Supersonics and X-Rays. J. J. Pierce. *Metal Progress,* v. 56, July 1949, p. 62-65.

Proceedings of recent symposium on techniques, held at the dedication of the million-dollar X-ray laboratory at Naval Ordnance Laboratory, White Oak, Md.

12-148. Specifications for Structural Steel in Low-Temperature Service. Albert W. Zeuthen. *Metal Progress,* v. 56, July 1949, p. 78-79.

Efforts toward coordination of current specifications rather than evolution of new specimens and tests.

12-149. The Probolog, for Inspecting Nonmagnetic Tubing. George A. Nelson. *Metal Progress,* v. 56, July 1949, p. 81-85.

Instrument for inspecting tubing of heat exchangers, condensers, coolers, without dismantling. A probe connected to a recording instrument and containing a pair of coils which generate a magnetic field is pulled at a constant rate through the tubing. The magnetic field penetrates the walls of the tube, inducing eddy currents which exert a riciprocal influence on the impedance of the coils. Pen deflections are related to the character and amount of defects, both external and internal.

12-150. New SAE Finish Standard Aims to Help Engineer and Shop Man. *SAE Journal,* v. 57, July 1949, p. 33-38.

The above and its use. The standard is published in the 1949 SAE Handbook.

12-151. Development and Effects of the Revised Screw Thread Standard. E. J. Bryant. *Tool Engineer,* v. 23, July 1949, p. 17-20.

One of the last formal steps in the presentation to industry of an international unified screw thread standard, the B1-1-1949 Report on the Standardization of Screw Threads, published under ASME sponsorship, has now been made available. Essentials of this report along with the story of the conferences leading to its adoption. Detailed comparison of the various present and unified threads.

12-152. Turbine-Blade Inspection. *Aircraft Production,* v. 11, July 1949, p. 234-236.

New Swiss equipment based wholly on optical principles.

12-153. Specifications for Magnesium Alloys. *Machinery,* v. 55, July 1949, p. 261.

12-154. Specifications for Aluminum Alloys. *Machinery,* v. 55, July 1949, p. 261.

12-155. Collecting Standardization Data. J. R. Townsend. *Standards World,* v. 1, Summer 1949, p. 31-50.

General procedures and details of three specific examples: determination of requirements for testing of nonferrous sheet metal; determination of the contact resistance of brass; and investigation of the accuracy of micrometers.

12-156. Checking a Splined Cone with the Auto-Collimator. W. F. Wiggs. *Machinery* (London), v. 75, July 14, 1949, p. 56.

Method is described and diagrammed.

12-157. Magnetic Analysis Inspection in the Steel Industry. Theodore Zuschlag. *American Society for Testing Materials,* "Symposium on Magnetic Testing", 1949, p. 113-120; discussion p. 121-122.

Problems of steel inspection and requirements for the above. Inspection methods, equipment, and industrial installations. Circuit diagrams.

12-158. Luminescent Method of Defect Detection in the Metal Working Industries. (In Russian.) M. M. Laushkina and F. I. Rogov. *Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya* (Bulletin of the Academy of Sciences of the USSR, Physical Series), v. 13, Mar.-Apr. 1949, p. 251-252; discussion p. 252-253.

Method for detecting cracks and other flaws in manufactured objects. Is recommended strongly because of its extreme simplicity, accuracy, and low cost.

12-159. Black Light Inspection of Castings. Franklin Catlin. *Foundry,* v. 77,

Aug. 1949, p. 168-170, 172, 174.
Method and applications.

12-160. Radiographic Examination of Large Carbide-Faced Parts. J. M. Williams. *Product Engineering,* v. 20, Aug. 1949, p. 130.

12-161. Checking Three-Fluted Taps. *Machinery,* v. 55, Aug. 1949, p. 161.
Technique used by Warner & Swasey Co.

12-162. Immersed Ultrasonic Inspection. Rebecca H. Smith and Donald C. Erdman. *Iron Age,* v. 164, Aug. 4, 1949, p. 83-88.
Method in which the scanning crystal is submerged in a liquid to minimize multiple reflections. Advantages claimed are a reduction in surface smoothness requirements; ability to focus the beam into fillets, complex surfaces and other areas not flat enough for contact crystals; and ability to use higher frequency crystals. Applications in stressed aircraft parts.

12-163. Testing Flash Butt Welds. *Iron Age,* v. 164, Aug. 4, 1949, p. 106.
Most important in getting good welds is the proper setting of the welding machine.

12-164. Test Jigs Insure Accurate Parts. Clarence Dunlop. *American Machinist,* v. 93, Aug. 11, 1949, p. 98-100.
Inexpensive gaging fixtures with guided plug gages and indicating pointers simplify inspection of small parts to close limits.

12-165. New Screw Thread Standards. E. G. Wertheimer. *Science,* v. 110, Aug. 12, 1949, p. 155-159.
Details agreed to by Great Britain, Canada, and the U. S.

12-166. (Book) **Principles of Magnaflux. Ed. 3.** F. B. Doane and C. E. Betz. 338 pages. Photopress, Inc. (available from Magnaflux Corp., 59 Northwestern Highway, Chicago 31, Ill.) $5.00.
Basic electrical principles through the range of methods, materials and equipment now in use. Applications in such fields as the railroads, high-production industries, welding, aircraft.

12-167. X-Ray Gaging of Flat Rolled Steel. D. I. Brown. *Iron Age,* v. 164, Aug. 18, 1949, p. 101-104.
Experiences in use of the X-ray gage in two midwest mills.

12-168. Aluminum Condenser and Heat Exchanger Tubes. J. S. Hamilton and J. J. Bowman. *ASTM Bulletin,* July 1949, p. 44.
Information about these materials which may help to evaluate their usefulness. (Supplementary to ASTM specification B234-48T.)

12-169. The Consumer Views Rough Casting Inspection. U. S. Sullivan. *American Foundryman,* v. 16, Aug. 1949, p. 56-58.
Methods and equipment.

12-170. Steel Specifications From the Consumer's Standpoint. Muir L. Frey. *Steel,* v. 125, Aug. 29, 1949, p. 60-63, 88.
Reviews AISI and SAE quality specifications. Suggests several refinements.

12-171. Industrial Radiography; Protective Equipment for the Handling of Radium Sources. *Metal Industry,* v. 75, Aug. 5, 1949, p. 109-110.

12-172. Stereoscopic Radiography. F. Hargreaves. *Engineer,* v. 188, Aug. 5, 1949, p. 154-155.
Technique applied to welding in locomotive construction and repair.

12-173. Steel Products Manual. Sec. 19. Railway Track Materials. Sec. 21. Concrete Reinforcing Bars. Sec. 23. Tolerances for Alloy Steel Sheets and Strip. Sec. 26. Flat Rolled Electrical Steel. Sec. 27. Rail Steel. *American Iron and Steel Institute,* 1949; 121, 48, 10, 100, and 12 pages.
Five booklets of a series. Standard grades, identification, testing, analyses, manufacturing procedures, metallurgical aspects, quality control, specifications.

12-174. Detection of Incipient Drill Pipe Failures. Walter C. Main. *Petroleum Engineer,* v. 21, Aug. 1949, p. B36, B38, B40, B42, B45-B46, B48, B50, B52, B54.
Previously abstracted from *Drilling.* See item 12-109, 1949.

12-175. Tolerances of Finished Metal Powder Parts. William R. Toeplitz. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 36-48; discussion, p. 48-50.
Diagrams of typical parts show that designers often specify ultra-precise tolerances for powdered metal parts, because they do not realize the true economic limits of such precision. Recommends more work on standardization of dimensional tolerance.

12-176. How Pennsylvania Railroad Uses X-Ray Inspection. David Goodman. *Iron Age,* v. 164, Sept. 1, 1949, p. 80-83.
Use of mobile 250,000-volt X-ray unit for checking pilot models of new and replacement parts, inspecting used parts, and checking quality of purchased parts.

12-177. Quality Control. *Welder,* v. 18

(new ser.), Apr.-June 1949, p. 35-38.
As applied to the manufacture of welding electrodes.

12-178. Quality Extras—and Why. Rebecca H. Smith. *Iron Age,* v. 164, Sept. 8, 1949, p. 75-77.
More realistic approach to the problems of "quality" materials, particularly concerning acceptable defects, could greatly decrease present extra costs. Problems posed by Magnaflux, X-ray, and ultrasonic inspection methods.

12-179. Checking "Split Thousandths" by Optical Projection Gaging Simplifies Production Control and Reduces Inspection Time. *Steel,* v. 125, Sept. 12, 1949, p. 110-112.
Comparator in combination with staging fixture designed for inspection within critical tolerances of 0.0001 in. Simplifies production control and reduces inspection time on watch and automobile parts, turbine blades, chains, etc.

12-180. Etude d'anomalies de réflexion et de transmission se produisant lors du sondage par les ultra-sons des métaux. (Study of Anomalies of Reflection and Transmission Occurring During Ultrasonic Testing of Metals.) P. Bastien, J. Bleton, and E. de Kerversau. *Revue de Métallurgie,* v. 46, May 1949, p. 277-286.
Such anomalies are caused by the presence of metal crystals the mean diameter of which equals a multiple of half the wave-length of the ultrasonic impulse. In the case of reflection, the effect is readily distinguishable from those resulting from defects, but this is not the case for transmission.

12-181. Control and Inspection of Heat Treated Parts. Part I. Howard E. Boyer. *Steel Processing,* v. 35, Aug. 1949, p. 418-423.
Selection of inspection methods which will reveal the most information directly related to the end use of the raw material. Various common test methods and importance of temperature control. (To be continued.)

12-182. Round Table Discussion on Ultrasonic Testing. *American Society for Testing Materials,* 23 pages.
Transcript of discussion held at the 51st annual meeting of the ASTM, Detroit, June 21, 1948.

12-183. (Book) **Metals and Alloys,** Ed. 5, rev. 214 pages. 1949. Iliffe and Sons, Ltd., Dorset House, Stamford St., London, S. E. 1, England. $4.00.
Covers about 4600 compositions, compared to a total of 3700 in the previous edition, and represents a complete revision. Specifications are listed in chart form for alloys usually regarded as nonferrous and are limited to those containing not more than 50% Fe.

12-184. (Book) **British Standards for Steel and Steel Products.** 674 pages. 1949. British Standards Institution, 28 Victoria St., London, S.W.1, England. 25s.
Consists of a number of descriptive articles on principles of steelmaking, casting, and forging; use of steel for metalworking and chemical plants; blooms, billets, slabs, and sheet bars and their qualities, chemical compositions, and purposes; British standards for the heavy industries; application of steel processes for pressure vessels, gas cylinders, and galvanizing.

12-185. (Book) **A.S.T.M. Standards on Light Metals and Alloys: Aluminum and Aluminum Alloys, Cast and Wrought; Magnesium and Magnesium Alloys, Cast and Wrought; Methods of Testing Light Metals.** 150 pages. Feb. 1949. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
A compilation of specifications and test methods.

12-186. Statistical Methods for Evaluating the Quality of Certain Wrought Steel Products. Edwin G. Olds and Cyril Wells. *American Society for Metals,* Preprint No. 16, 1949, 47 pages.
The importance of the frequency distribution for summarizing data. Utilization of certain parameters to characterize the central tendency and dispersion of frequency distribution. Examples illustrate the meaning of some "tests of significance" developed by statisticians. 47 ref.

12-187. Master Measuring System Checks Jet-Engine Blades. Dan White and Henry Meltzer. *American Machinist,* v. 93, Sept. 22, 1949, p. 91-95.
How a modified toolmaker's microscope can measure curved surfaces of turbine blades within ±0.0003 in.

12-188. Nickel Alloy Steel Castings to British Standard Specifications Nos. 1458 and 1459. *Nickel Bulletin,* v. 22, May 1949, p. 70-74.
Scope and potentialities of alloy steel castings; specification features of particular interest to designer, founder and user; and recommended Ni alloy steel-casting compositions appropriate to meet specification requirements.

12-189. A Survey of Car Body Production Methods at Vauxhall Motors Ltd. Maurice J. Seymour. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1947-1948.
Inspection procedure.

12-190. Brazed Tool-Tips: Non-Destructive Testing Method Developed by the Bristol Aeroplane Co., Ltd. *Aircraft Production*, v. 11, Sept. 1949, p. 295-297.

Galvanometer setup for testing the adhesion of brazed joints in tipped milling-cutters. The system is adaptable for checking almost any type of brazed joint or other thin metallic film.

12-191. Railroad Track Inspection Car. Robert D. Walker, Jr. *Electronics*, v. 22, Oct. 1949, p. 66-68.

Self-propelled mobile laboratory which permits nondestructive inspection of railroad tracks. Special generator passes large currents through rails and search coils detect internal flaws which are accompanied by nonuniformities in the magnetic field surrounding the railhead.

12-192. The Case of the Perjured Control Chart. V. E. McCoun. *Tool & Die Journal*, v. 15, Oct. 1949, p. 54-57. Reprinted from *Industrial Quality Control*, v. 5, no. 6.

Charted results of study of an automatic multiple-tool lathe operation show the value of a continuous chart of consecutive parts from an operation and the desirability of deliberately staggering the time interval between samples to a greater extent than is usually considered necessary.

12-193. Achieving Quality Control Through Statistical Methods Plus Tool Control. *Tool & Die Journal*, v. 15, Oct. 1949, p. 58-60, 62.

Methods used at G. E.'s automatic washer plant.

12-194. Quality Control at Lamson and Sessions. Charles R. Kendel. *Tool & Die Journal*, v. 15, Oct. 1949, p. 72, 74, 76, 97.

12-195. Quality Considerations in Designing and Producing Grinding Machine Ways. *Tool & Die Journal*, v. 15, Oct. 1949, p. 82, 84-85.

12-196. Magnaglo Inspection Before Machining Saves Costs. *Automotive Industries*, v. 101, Oct. 1, 1949, p. 36-37.

Magnaflux unit and its operation at Willys-Overland for inspecting a large variety of forgings. Detects defects before parts enter the machine shop.

12-197. The Value of Pressure Tests and Radiographs of Gun Metal Castings. W. H. Baer. *Transactions of the American Foundrymen's Society*, v. 56, 1948, p. 355-361; discussion, p. 360, 362.

Previously abstracted from *American Foundrymen's Association*, Preprint 48-43. See item 11-98, 1948.

12-198. Industrial Applications of Radiography in the Inspection of Welds. L. Mullins. *Sheet Metal Industries*, v. 26, Oct. 1949, p. 2193-2206.

Extensive details of procedures and applications. 29 ref.

12-199. Light Gages Check External Tapers. Bernard R. Better. *American Machinist*, v. 93, Oct. 20, 1949, p. 76-77.

Easily constructed gages which permit greater accuracy and increased speed in checking precision tapers of production machines.

12-200. Standard Wire Rope. *American Machinist*, v. 93, Oct. 20, 1949, p. 125.

Breaking-strength data and weights per linear foot for various types and sizes.

12-201. (Book) **1949 SAE Handbook.** 933 pages. 1949. Society of Automotive Engineers, 29 West 39th St., New York. $10.00. ($5.00 to members.)

Extensively revised. 31 new automotive standards and specifications have been added, and 9 have been cancelled. Standardized for the first time is a series of alloy steels that may be bought to hardenability specifications.

12-202. Inspecting Forged Turbine Blades and Buckets. R. F. Wagner. *Steel*, v. 125, Oct. 24, 1949, p. 66-67.

Quality control procedures necessary to meet extremely close tolerances.

12-203. Aircraft Firms Coordinate Metals Specifications. *Western Metals*, v. 7, Oct. 1949, p. 39.

Program on the West Coast. Firms involved and items in question.

12-204. Observations sur le controle des pièces résistantes moulées en alliages légers et ultra légers. (Observations on Inspection of Cast Structural Light-Alloy Parts for Defects.) M. R. Chion. *Fonderie*, Aug. 1949, p. 1687-1701.

Results of investigation indicate that the most important factor in any test method is the duplication of service conditions during testing.

12-205. Tool Standardization at Thompson Products. W. D. Angst. *Tool & Die Journal*, v. 15, Nov. 1949, p. 47-52.

12-206. A New Concept of Surface Measurement. 1. Present Methods of Surface Finish Control and Development of Geometric Surface Finish Standards. Arthur F. Underwood and Roy P. Trowbridge. **2. The Calibration and Use of Master Roughness Standards.** C. R. Lewis. *Tool Engineer*, v. 23, Nov. 1949, p. 17-24.

Development of ruled surface-finish standards by General Motors. Originals are made on 2x3-in. blocks of silver-clad steel plates with gold.

The surface is polished to an average roughness of one microinch. Rulings are made on a special machine with a diamond stylus. Duplicates are made by an electroforming process. Method of calibration and use of Nelson's taper sectioning method which increases magnification in one direction by as much as 25 to 1.

12-207. Handy Quality Control for the Machine Shop. Clifford W. Kennedy. *Modern Machine Shop*, v. 22, Nov. 1949, p. 126-128, 130, 132, 134, 136, 138-139.

The standard-deviation, frequency-distribution, quality-control technique.

12-208. Xeroradiography; A Basic Development in X-Ray Testing. *Iron Age*, v. 164, Nov. 10, 1949, p. 91. Based on paper by R. C. McMaster and R. M. Schaffert.

All-electric method for obtaining permanent, low-cost X-ray images developed at Battelle Memorial Institute. It eliminates film and chemical processing and hence the usual time delay between exposure and examination. Contrast sensitivity exceeds the 2% required for inspection of aircraft parts. The process possesses unusual local-contrast sensitivity and definition exceeds 200 lines to the inch.

12-209. Inspection Methods of New and Used Oil Country Tubular Goods. M. W. Newman. *Non-Destructive Testing*, v. 8, Summer 1949, p. 9-13.

12-210. Aircraft Non-Destructive Testing. William C. Hilt. *Non-Destructive Testing*, v. 8, Summer 1949, p. 14-18.

Methods for the above with emphasis on Magnaflux and Zyglo.

12-211. Railroad Non-Destructive Testing. Arthur S. Pedrick. *Non-Destructive Testing*, v. 8, Summer 1949, p. 19-24.

The various methods, their advantages, limitations, and applicabilities.

12-212. Petroleum Refinery Non-Destructive Testing. G. C. Vergne. *Non-Destructive Testing*, v. 8, Summer 1949, p. 25-32.

Various methods, indicating advantages, limitations, and applicabilities.

12-213. Oil Tool Manufacturing and Non-Destructive Testing. Frank R. Drahos. *Non-Destructive Testing*, v. 8, Summer 1949, p. 33-35.

Magnetic-particle inspection, mobile Magnaflux testing, radiography, and strain-gage analysis.

12-214. Product Quality Standards in the Porcelain Enamel Industry. G. H. Spencer-Strong. *Standards World*, v. 1, Autumn 1949, p. 35-42.

Progress in development of standards.

12-215. Steel Products Manual. Sec. 6. Carbon Steel Plates and Rolled Floor Plates. Sec. 11. Carbon Steel Sheets. Sec. 13. Cold Rolled Carbon Steel Strip. *American Iron and Steel Institute*, Sept. 1949, 122, 155, and 78 pages respectively.

Metallurgical aspects, manufacturing practices, quality and chemical requirements, and handling methods.

12-216. Radiography—A Refinery Corrosion Inspection Tool. J. H. Stewart. *Petroleum Processing*, v. 4, Nov. 1949, p. 1211-1214.

Use by some Gulf Coast refiners for determining corrosion, wall thickness, and other conditions of vessels, piping, etc.

12-217. Correct Manufacture and Use Determine Lasting Gage Block Accuracy. H. J. Chamberland. *Steel*, v. 125, Nov. 14, 1949, p. 116, 118.

Recommended procedures.

12-218. Ultrasonics: A Brief Survey. John H. Jupe. *Electronic Engineering*, v. 21, Nov. 1949, p. 422-424.

Metallurgical and nonmetallurgical applications. 126 ref.

12-219. Notes on the Use of Radon in Engineering Radiography. V. E. Pullin. *Engineer*, v. 188, Oct. 21, 1949, p. 452-453.

Availability, protection, technique, and equipment.

12-220. Magnetinduktive Stahlprüfung. (Magneto-Inductive Testing of Steel.) Kurt Matthaes. *Zeitschrift für Metallkunde*, v. 39, Sept. 1948, p. 257-272.

Instrument and its use in detecting defects and sorting steel tubes and bars.

12-221. (Book) Taper Calculation and Inspection. 74 pages. 1949. Machinery Publishing Co., Ltd., National House, West St., Brighton, England. (Agent: Industrial Press, 148 Lafayette St., New York 13, N. Y.) 3s. 6d.

Fundamental formulas for calculating tapers; universal taper measuring gages and inspection gage-blocks, as well as methods of gaging taper fit assemblies; angular tolerances of taper plug and ring gages and their effects. Tables facilitate calculation.

12-222. Punch and Die Sets. *American Machinist*, v. 93, Nov. 3, 1949, p. 237, 239; Nov. 17, 1949, p. 135.

A proposed American Standard sponsored by ASME in conjunction with SAE, Metal Cutting Tool Institute and National Machine Tool Builders' Association. Nov. 3 issue: Two series of punch and die sets, back-post sets and diagonal-post sets. Nov. 17 issue: Dimensions for guide-post bushings.

12-223. An Apparatus for Detecting Superficial Cracks in Wires. P. Zijlstra.

Philips Technical Review, v. 11, July 1949, p. 12-15.

Equipment uses high-frequency alternating current.

12-224. Radiography of Welds in Ship Construction. D. S. Beard. *Welding,* v. 17, Nov. 1949, p. 511-517.

12-225. Odd-Sized Holes to Millionths. E. J. Tangerman. *American Machinist,* v. 93, Dec. 1, 1949, p. 77-80.

Laboratory procedure has now been developed to attain a standard within $\pm$ 0.000002 and to transfer dimension to a hole with 0.000008. Diagrams show method of use.

12-226. White Magnetic Fluid for Crack Detection. *Engineer,* v. 188, Nov. 4, 1949, p. 533.

Use of new type of fluid made by ball milling a mixture of approximately equal parts by volume of aluminum and iron oxide prior to dilution with paraffin, or methyl alcohol, according to the type of base. Tests with specimens known to contain cracks show that there is no reduction in sensitivity due to the addition of Al powder. Surface cracks are shown as white lines.

12-227. Integrated Quality Control Makes Possible Large-Scale Production of Precision Bearings. Walter F. Toerge. *Steel,* v. 125, Dec. 5, 1949, p. 98-102, 104.

Coordination of inspection and machine-shop procedure in production and assembly of ball bearings.

12-228. Light Rays Can Be Tools. A. P. Fultz. *Tool & Die Journal,* v. 15, Oct. 1949, p. 64, 66, 68, 70-71; also *Instruments,* v. 22, Nov. 1949, p. 1050-1054. (Allen R. Fultz.)

Various uses of optics for gaging in the shop or plant.

12-229. Non-Destructive Testing of Metals Eliminates Costly Rejects. Rebecca H. Smith. *Western Metals,* v. 7, Nov. 1949, p. 32-34.

Surveys applications.

12-230. Steel Products Manual. Sec. 7. Alloy Steel Plates. *American Iron and Steel Institute,* Oct. 1949, 66 pages.

Metallurgical aspects, manufacturing practices, quality requirements, chemical requirements, and handling methods. Includes standard practice tables.

12-231. Technological Precision and Fineness of Machining. (In Russian.) A. A. Matalin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 19-22.

Analyzes surface-finish standards used by the Bureau of Standards and the U.S.S.R. Classification according to this standard and its relation to different types of material and methods of machining.

12-232. Checking Castings: Special-Purpose Fixtures; Examples of Design and Application by the de Havilland Engine Co., Ltd. *Aircraft Production,* v. 11, Dec. 1949, p. 413-420.

A system of checking castings for dimensional accuracy before machining. The workpieces remain in the fixtures for preliminary location-drilling, thereby eliminating a considerable proportion of setting-up time. Example shows that the system is adaptable to castings of widely differing forms as well as sizes.

12-233. Accurate Method of Measuring Dovetails. L. F. Wilharm. *Machinery* (American), v. 56, Dec. 1949, p. 178-179, 237.

A method of measuring dovetails based on the sine-bar principle of measuring angles. Data sheets facilitate use of the tool.

12-234. Efficient Gear Inspection in a Gear Job Shop Cuts Rejects, Increases Quality. *Machine and Tool Blue Book,* v. 45, Dec. 1949, p. 130-132.

SECTION XIII

TEMPERATURE MEASUREMENT and CONTROL

13-1. Temperature Control. I. Principles and Practices for Die-Casting Dies. H. K. Barton. *Metal Industry,* v. 73, Dec. 10, 1948, p. 463-466; Dec. 17, 1948, p. 491-493; Dec. 24, 1948, p. 503-506.

Methods of modifying and controlling die temperature for maximum output. Methods for obtaining the necessary heat transfer. Heat dissipation from cores, control of cavity temperature by the use of inserts, and electrical heating of dies.

13-2. A Method of Constructing Cu-Constantan Thermocouples. Howard J. Carter. *Review of Scientific Instruments,* v. 19, Dec. 1948, p. 917-918.

Technique using electroplating instead of welding or soldering, which is applicable to very small wires required for certain work.

13-3. A Radiation Pyrometer for Low Temperatures. F. E. Hessey. *Steel Processing,* v. 34, Dec. 1948, p. 644-648.

Construction, operation and applications of above instrument made by Brown Instrument Co., and applicable to the 100-600° F. range. Requires reasonably high emissivity. Polished metals usually have too low an emissivity for satisfactory application to them.

13-4. Built-In Controls for Pressure and Temperature. Frank E. Reeves. *Electrical Manufacturing,* v. 43, Jan. 1949, p. 105-109, 186, 188, 190, 192.

Factors discussed aid in selecting the best control when control of pressure or temperature is essential for best performance.

13-5. Advanced Temperature Measurement; Steel Industry's Methods for Extreme Ranges. *Chemical Age,* v. 60, Jan. 1, 1949, p. 15-16.

Methods used on the Continent.

13-6. Photoelectric Control of High-Temperature Furnaces. F. C. Todd. *Electronics,* v. 22, Feb. 1949, p. 80-83.

By means of the equipment described, temperatures up to 2500° C. can be held within 1% for days. A vacuum phototube serves as sensing element feeding cascaded d.c. bridge amplifiers or an a.c. bridge, followed by an amplifier that actuates on-off or continuous phase-shift thyratron control of the furnace.

13-7. Measuring Steel Bath Temperatures by Purged Tube Method. *Steel,* v. 124, Jan. 31, 1949, p. 65-66.

Equipment developed by Brown Instrument Co. and its method of use.

13-8. Pyrometer for Molten Steel. *Electronics,* v. 22, Feb. 1949, p. 152, 154, 156.

Photoelectronic apparatus developed by Brown Instrument Co. A 7-ft. sighting tube is immersed in the molten metal. Compressed air forced through the tube forms a pocket in the metal.

13-9. Thermocouple for Determination of Steel-Bath Temperatures. (In Russian.) V. G. Gruzin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Nov. 1948, p. 1396-1397.

Describes and diagrams equipment.

13-10. Steel Temperature Measurement and Control of Billet Heating Furnaces. *Industrial Heating,* v. 16, Jan. 1949, p. 82. A condensation based on paper by Fred S. Bloom.

13-11. Laboratory Evaluation of a Method Proposed by Gnam for Measuring the Temperature of Rotating Parts. Andrew I. Dahl and Paul D. Freeze. *Journal of Research of the National Bureau of Standards,* v. 41, Dec. 1948, p. 601-607.

A rotating circuit, consisting of a thermocouple in series with the rotor coils of a converter, and a stationary circuit, consisting of the stator coils of the converter and a transformer, are linked magnetically. One thermocouple junction is fixed to the rotating part, and the other protrudes from a hollow shaft

into the furnace. Full-scale application seems practicable.

13-12. Life Test for Pyrometers. J. T. Cataldo. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 129-130, 132.

Device which automatically applies alternate hot and cold cycles to pyrometer instruments to evaluate service life.

13-13. A Six-Point, High-Speed, Thermocouple Temperature-Recording Equipment. J. D. Watson and H. E. Dixon. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 17-18.

13-14. The Electronic Measurement and Control of Heat. Part I. (no subtitle) **Part 2. High Temperatures in Industrial Processes.** John H. Jupe. *Electronic Engineering,* v. 21, Jan. 1949, p. 13-16; Feb. 1949, p. 48-51.

Methods and diagrams of circuits. (To be concluded.)

13-15. Temperature Control for Hardening Drill Steel. H. O. Howey. *Canadian Mining and Metallurgical Bulletin,* v. 42, Jan. 1949, p. 10.

Radiation-type thermocouple, connected to a high-internal-resistance pyrometer, used to regulate hardening temperatures of conventional drill steel.

13-16. Response Characteristics of Thermometer Elements. A. J. Hornfeck. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 121-132; discussion, p. 132-133.

The significance of time constant as a basis of comparing elements; effects of varying design factors such as socket size, materials, and internal element structure. Methods for determining temperature-vs.-time response curves of elements in a medium whose temperature changes suddenly, uniformly, and sinusoidally. 11 ref.

13-17. The Use of Precious Metal Thermocouples at High Temperatures. M. K. McQuillan. *Division of Aeronautics, Council for Scientific and Industrial Research, Commonwealth of Australia* (Melbourne), Structures and Materials Note 171, Oct. 1948, 7 pages.

A study on effects of heating platinum, platinum-rhodium thermocouples in air, in vacuum, and in hydrogen; and in the presence of various refractory materials.

13-18. The ABC's of Multi-Element Control. Clayton H. Barnard. *Instruments,* v. 22, Feb. 1949, p. 179-181.

Multi-element temperature control is clarified by text and simple diagrams.

13-19. Precision of Heat Transfer Measurements With Thermocouples—Insulation Error. W. A. Mohun. *Canadian Journal of Research,* v. 26, sec. F, Dec. 1948, p. 565-583.

Method for calculating temperature variation in insulated thermocouple lead wires. The difference between the junction temperature and that of the surrounding material is called "insulation error." This error is determined by variations in the temperature of the path followed by the lead wires only over a limited distance from the junction, called the "critical distance." Hence, to eliminate insulation error, the path need be isothermal only for this distance.

13-20. Industrial High-Speed Infrared Pyrometer. W. S. Gorrill. *Electronics,* v. 22, Mar. 1949, p. 112-114.

Accurate measurement of the temperatures of tin cans moving at high speeds by the use of infrared pyrometry. Proper adjustment of heating flames and cooling air is maintained by measuring the temperature of the soldered seams as the cans pass from one operation to the next at normal operating speeds.

13-21. A Bath Immersion Pyrometer. P. M. Johnson. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 250-252; discussion, p. 252-254.

Construction and use. Errors in use.

13-22. "Heat Inertia" in Problems of Automatic Control of Temperature. Victor Broida. *Instruments,* v. 22, Feb. 1949, p. 136-138, 160-164, 166.

A new calculation method for solving practical process-control problems in a wide variety of fields is based on the concept of the "fictitious mass" of a heat-process unit under automatic control. (To be continued.)

13-23. A Versatile High-Speed Temperature Recorder. T. W. Kethley and W. B. Cown. *Research Engineer* (Georgia Institute of Technology), Mar. 1949, p. 5-6, 22-24.

System for high-speed recording of thermocouple temperatures over a wide range using inexpensive commercially available equipment. It is capable of recording temperature ranges as small as 1° F. or as great as 1000° F.; it has a sensitivity of about 1%, and it can record temperature changes at chart speeds as high as 0.2 in. per sec. or as low as 0.75 in. per hr.

13-24. What's Inside Temperature Controls? Part 1. David Fidelman. *American Machinist,* v. 93, Mar. 24, 1949, p. 94-97.

Systems for temperature measurement. Why electronic controllers help small as well as large shops.

13-25. Tungsten-Molybdenum Thermocouples. R. D. Potter and N. J. Grant. *Iron Age,* v. 163, Mar. 31, 1949, p. 65-69.

Use in the study of high-temperature alloys has resulted in improvement of the range of satisfactory service up to 3990° F. Metallurgical factors to be observed in order to attain optimum results. Procedure for calibrating the thermocouple. Influence of contamination on standard calibration curves.

13-26. The Fundamentals of Pyrometry. III (Concluded.) W. H. Steinkamp. *Industrial Heating,* v. 16, Mar. 1949, p. 432, 434, 436, 438, 440, 442.

Radiation pyrometers; the Radiamatic tube; the radiant-energy theory; optical pyrometry, and the Optimatic system. Emissivity table for common materials.

13-27. Low Temperature Radiation Pyrometry in Industry. J. C. Mouzon and C. A. Dyer. *Journal of the Optical Society of America,* v. 39, Mar. 1949, p. 203-210.

Problems encountered, with particular emphasis on the measurement of low surface temperatures 100-400° F.). A low-range radiation pyrometer for use on such applications.

13-28. What's Inside Temperature Controls? Part 2. David Fidelman. *American Machinist,* v. 93, Apr. 7, 1949, p. 112-115.

Circuit diagrams and explanations of four basic types of timing for heat treating processes, as found in commercial devices.

13-29. A Method of Controlling Rate-of-Change of Temperature. P. H. Bigg and F. D. Jones. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Mar. 1949, p. 109-111.

Rate of change of temperature may be controlled automatically by transforming it into a temperature difference, by use of differing thermal-time constants, and using this temperature difference to control heat input or extraction. A particular application. Adaptation to precise control.

13-30. "Heat Inertia" in Problems of Automatic Control of Temperature. Part II. Victor Broida. *Instruments,* v. 22, Mar. 1949, p. 222-224, 254, 256, 258, 260, 262, 264.

Some problems related to continuous automatic control systems. Three of the simpler types of automatic controllers. Consists largely of mathematical derivations. (To be continued.)

13-31. Apparatus for Automatic Uniform Controlled Rise of Temperature. V. C. Taxwood and C. R. Stock. *ASTM Bulletin,* Mar. 1949, p. 76-77.

Apparatus successfully used in plastics testing. However, it is believed applicable to many other purposes, for example, control of electrical annealing furnaces.

13-32. A Modification of the Gouy Modulator. L. S. Darken. *Review of Scientific Instruments,* v. 20, Apr. 1949, p. 323-324.

Improved device for temperature control up to 1650° C. Cyclic temperature variation near 900° C. was reduced from 8 to 0.3° C. Advantages include: absence of any moving contacts in the thermocouple circuit; absence of any wired connection between thermocouple circuit and any other circuit; true zero mean cyclic voltage; failure of the modulator leads merely to absence of modulation and does not otherwise disrupt control; and no metal other than copper is used in the circuit.

13-33. Quality Control in the Open Hearth. Part IV. Use of Bath Immersion Pyrometers. (Concluded.) Frank G. Norris. *Industrial Heating,* v. 16, Apr. 1949, p. 646, 648, 650.

Essential details of construction, maintenance and operation for optimum results, for accurate bath readings and drastic reduction of skull losses.

13-34. Method of Investigation of Temperature Distribution in the Working Space of Furnaces. (In Russian.) N. P. Zgonnik. *Ogneupory* (Refractories), Jan. 1949, p. 28-30.

Different methods for the above, such as pyrometric cones, differential thermocouples, and an indirect method based on contraction of certain ceramic materials during baking. The last method is particularly recommended for temperatures of 1150-1550° C.

13-35. Les Compensateurs d'Inertie Thermique. (Compensators for Thermal Inertia.) J. Bernot. *Journal du Four Electrique et des Industries Electrochimiques,* v. 58, Jan.-Feb. 1949, p. 20-22.

Proposes a new type of compensator for temperature regulators. Details of construction. (To be continued.)

13-36. Temperature Measurement in

Metallurgical Industries. A. Linford. *Metal Treatment and Drop Forging,* v. 16, Spring 1949, p. 38-48.

Theory of various temperature-measuring techniques, recent developments, and typical commercial instruments.

13-37. "Heat Inertia" in Problems of Automatic Control of Temperature. Part III. Actual Controllers. Victor Broida. *Instruments,* v. 22, Apr. 1949, p. 324-325, 362, 364, 366.

A series of automatic temperature controllers, each corresponding to one of the automatic-control systems studied theoretically. Similarity between theoretical conclusions drawn from mathematical study of these systems and experimental observations. (To be continued.)

13-38. Le réglage de la température. (Control of Temperature.) H. Bauer. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 445-458; discussion, p. 479-487.

Principles, apparatus, and applications.

13-39. Liquid Iron and Steel Temperatures in Practice. T. B. Winkler. *Blast Furnace and Steel Plant,* v. 37, May 1949, p. 536-542.

Design and use of Pt immersion thermocouples for study of liquid iron and steel temperatures at various stages in both the basic-electric and the basic openhearth steelmaking process. Temperature losses during such operations as transfer from blast furnace to openhearth, from furnace to pouring ladle, while standing in the ladle, etc.; also rate of increase of bath temperature vs. amount of fuel oil used per hr.

13-40. Automatic Temperature Control of Industrial Processes. E. B. Estabrook. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 139-145.

Classified into general types. Principles of construction from a nonmathematical point of view.

13-41. Process Reactions Encountered in Automatic Temperature Control Installations and Some Means of Maintaining the Desired Balance or Condition Within the Process With Reduced Lag. E. Ferner. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 146-149.

Schematic and circuit diagrams.

13-42. Temperature Measurements on Liquid Steel. S. Fornander. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 233-237.

Experiments made with the quick-immersion method. A pyrometer of British design for high-frequency induction furnaces gave good results with respect to reproducibility and accuracy. 80 measurements could be made with one and the same hot junction without any measurable change in e.m.f. For openhearth and electric-arc furnaces the design was also based on British models. Construction was changed in such a way that no parts are likely to give off gases when heated. Good reproducibility was obtained. 15 ref.

13-43. "Heat Inertia" in Problems of Automatic Control of Temperature. Part III. Actual Controllers. (Continued.) Victor Broida. *Instruments,* v. 22, May 1949, p. 406, 450, 452, 454, 456, 458.

Details of application of principles expounded in previous installments to positioning-type controllers. Present and potential applications of the new formulas.

13-44. High Speed, Thermocouple Temperature-Recording Equipment. E. J. Leaton. *Journal of Scientific Instruents and of Physics in Industry,* v. 26, May 1949, p. 161-162.

Apparatus has been used to record thermocouple readings at a rate of 8 per sec., with ±2% accuracy.

13-45. Optical Pyrometry; Influence of Smoke and Atmospheric Absorption in Steelworks. J. A. Hall. *Iron and Steel,* v. 22, May 12, 1949, p. 210-212.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 13-52, 1948.

13-46. Determination of Temperature of Salt Baths. (In Russian.) N. I. Brykushin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Mar. 1949, p. 374-375.

A special attachment for the radiation pyrometer which is said to assure accurate control of the salt-bath temperature up to 1280° C.

13-47. Temperature Measurement; An Outline of Some Methods Used in Industry. H. Thompson and E. H. Lloyd. *Sheet Metal Industries,* v. 26, June 1949, p. 1259-1263.

13-48. Heat Shading of Metals; A Valuable Research Aid. *Western Machinery and Steel World,* v. 40, June 1949, p. 78-79, 106.

Color-analysis system developed

by Rebecca H. Smith, chief metallurgist of Turbodyne Corp., Hawthorne, Calif. How the method is used to determine maximum operating temperatures of turbine blades and other parts following test runs. Color shadings of components are compared with a "sample box" prepared by the laboratory.

13-49. High Temperature Testing Requires Top Accuracy. C. C. Roberts. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 22, 37.

Creep-test furnace and commercial control equipment.

13-50. New International Temperature Scale. *Metal Industry,* v. 74, June 24, 1949, p. 504, 506.

The Ninth General Conference on Weights and Measures adopted last October a revised International Temperature Scale which, at high temperatures, differs in some important respects from the original International scale of 1927. The new scale came into force on January 1, 1949. Construction of scales and behavior of ideal gas.

13-51. Calculation of Temperature on the Basis of Indication of a Platinum-Platinum-Rhodium Thermocouple. (In Russian.) B. I. Pilipchuk. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, Apr. 1949, p. 492-494.

Simplified formulas for the above calculation.

13-52. Iets over de temperatuurregeling van ovens ten behoeve van thermische analyses. (The Temperature Control of Furnaces Used for Thermal Analysis.) E. M. J. Mulders. *Metalen,* v. 3, Apr. 1949, p. 165-168; *Central Instituut voor Materiaal Onderzoek Afdeling Metalen,* Apr. 1949, p. 1-4.

Temperature-control device for ovens and furnaces by which a linear temperature-time function can be realized.

13-53. Gas Temperature Measurement Above 1500° C. R. Mayorcas. *Journal of the Institute of Fuel,* v. 22, June 1949, p. 251-255.

Where determination of the gas temperature as such is essential, the suction pyrometer can be modified to permit measurements up to 2000° C. For many thermal-efficiency calculations in connection with high-temperature processes, however, the real requirement is direct measurement either of heat transfer or of the heat content of the gases involved. The first can be made with the heat-flow meter recently developed in England, and the second by continuous gas calorimetry with the sensible-heat meter. 20 ref.

13-54. The Use of Semi-Conducting Ceramic Glazes for the Measurement of Temperature. J. S. Forrest. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, July 1949, p. 254-255.

A method for measuring moderate temperature by means of the resistance of a small porcelain element glazed with a semiconducting ceramic material. Calibration curve of a typical element from 0 to 160° C.

13-55. Welder for Attaching Fine Wires to Massive Metal Bodies. W. J. Trott. *Review of Scientific Instruments,* v. 20, Aug. 1949, p. 624-625.

Purpose is to secure good thermocouple junctions for measurement of surface temperatures.

13-56. Advantages of Resistance Thermometers. Paul G. Weiller. *Electrical Manufacturing,* v. 4, Sept. 1949, p. 104-107, 204.

Recent development of suitable amplifying means widens uses for this method as a built-in control. Circuit diagrams and illustrations of commercial instruments.

13-57. Oberflächenmessung der Temperatur. Berechnung der Wärmeströmung in das Thermometer. (Measuring Surface Temperature. Computing the Heat Flow Into the Thermometer.) Franz Moeller. *Archiv für Technisches Messen,* July 1949, p. T53-T54 (4 p.)

Inaccuracies in surface-temperature measurements are caused by heat gains or losses and by heat-flow resistances. Formulas for computing the necessary correction factors.

13-58. The Tungsten-Iridium Thermocouple for Very High Temperatures. Walter C. Troy and Gary Steven. *American Society for Metals,* Preprint No. 19, 1949, 20 pages.

Operating between 1600 and 2000° C., calibrations were made for thermocouples representing combinations of W, Mo, Ta, Pt, Rh, Ir, and alloys of these metals. In a neutral atmosphere, optimum properties and performance were obtained with the W-Ir thermocouple. Table lists the computed emf. for temperatures between 1000 and 2100° C. for this couple.

13-59. Temperature Measurement in Basic Arc Furnace. C. B. Post and D. G. Schoffstall. *Journal of Metals* (News Section), v. 1, Oct. 1949, p. 12-17.

Experience at Carpenter Steel Co. with the optical pyrometer (1926-1947), the immersion thermocouple (1946-1948), and the Leeds & Northrup immersion Rayotube. Modification and application of the immersion Rayotube.

13-60. Optical Temperature Scale and Emissivity of Liquid Iron. Minu N.

Dastur and Nev. A. Gokcen. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 185), Oct. 1949, p. 665-667.

Results of true and apparent optical temperature readings are plotted. Procedure for evaluating transmissivity and emissivity values from such a scale. 20 ref.

13-61. Controlling Temperature in Hot Metal Working Operations. E. F. Mosthof. *Machinery* (London), v. 75, Sept. 29, 1949, p. 444-446.

Typical set-up in which a photoelectric unit is used to control temperatures. By this means, every part can be heated to the same temperature regardless of differences in wall thickness.

13-62. Dynamic Accuracy in Temperature Measurement. J. G. Ziegler and N. B. Nichols. *Science*, v. 110, Oct. 7, 1949, p. 361-363. A condensation.

Use of a derivative transmitter to achieve dynamic compensation for the inevitable lag of thermal elements. This is said to make possible a degree of speed and accuracy not previously obtained.

13-63. A Mechanism for Controlling Several Furnaces Independently With One Temperature Regulator. H. H. Macey. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Sept. 1949, p. 312-314.

Simple mechanical device.

13-64. Some Basic Concepts of Thermoelectric Pyrometry: Peltier and Thomson Effects, Laws of Intermediate Temperatures and Metals. C. C. Roberts and C. A. Vogelsang. *Industrial Heating*, v. 16, Oct. 1949, p. 1754, 1756, 1900, 1902, 1904, 1906, 1908.

13-65. Control and Inspection of Heat Treated Parts. Part II. (Concluded.) Howard E. Boyer. *Steel Processing*, v. 35, Oct. 1949, p. 537-541, 562.

Miscellaneous procedures and equipment for temperature-control and inspection.

13-66. Interpolation Formulas for Platinum Resistance Thermometers and Platinum-Rhodium vs. Platinum Thermocouples. (In Russian.) B. I. Pilipchuk. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, June 1949, p. 667-672.

Formulas for calibration.

13-67. Some Observations on the Behaviour of Platinum/Platinum-Rhodium Thermocouples at High Temperatures. M. K. McQuillan. *Journal of Scientific Instruments and of Physics in Industry*, v. 26, Oct. 1949, p. 329-331.

Effect of heating at high temperatures on the Pt-Rh element of Pt thermocouples. In air, more Pt than Rh is lost by preferential oxidation, and in vacuo, by volatilization. Very little metal is lost on heating in hydrogen. An explanation of those effects. Effect of heating Pt wires in a reducing atmosphere in the presence of refractory materials other than those containing silicon.

13-68. Thermocouple for the Measurement of Steel Bath Temperatures. V. G. Gruzin. *Engineers' Digest*, v. 10, Oct. 1949, p. 344. Translated and condensed.

Previously abstracted from *Zavodskaya Laboratoriya* (Factory Laboratory). See item 13-9, 1949.

13-69. Elektronen-gesteuerter Schnellthermostat. (Electron-Controlled Rapid-Acting Thermostat.) H. Unstätter. *Chemie-Ingenieur-Technik*, v. 21, Sept. 1949, p. 342-345.

The theory of thermostats. A new and improved type. Graphs show the degree of constancy in the temperatures of furnaces controlled by this type of thermostat.

13-70. Determination of Cutting Temperature. (In Russian.) N. I. Leonov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 22-23.

Characteristics of two types of thermocouples commonly used for the above. Advantages and disadvantages of each.

13-71. Notes on the Experimental Technique of Some Physico-Chemical Measurements Between 1000° and 2000° C. J. A. Kitchener and J. O'M. Bockris. *Faraday Society*, "The Physical Chemistry of Process Metallurgy", Discussion No. 4, 1948, p. 91-100; discussion, p. 108-126.

Previously abstracted from *Faraday Society Transactions*, Preprint. See item 13-43, 1948.

13-72. Temperatures in the Open-Hearth Furnace. Robert B. Sosman. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 176, 1948, p. 15-51.

Previously abstracted from *Metals Technology*. See item 13-40, 1948.

13-73. Metallographic Study of Heat Flow in Rocket Motor Walls. M. C. Sanz and H. C. Ibsen. *Metal Progress*, v. 56, Nov. 1949, p. 685-687.

The large and transitory temperature gradients through the walls cannot be determined satisfactorily by thermocouple or thermometric measurements or by use of temper colors or hardness readings. A method was developed based on the fact that part of the rocket wall undergoes the martensite-austenite reaction during

firing. Photomicrographs and hardness tests show the location of the boundary between transformed and untransformed zones. From this information, hot-wall temperatures may be approximated, by the method described, which was applied to a motor with walls of normalized SAE X4130 steel.

13-74. Controlling and Measuring Steel Temperatures in Billet Heating Furnaces. Fred S. Bloom. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 60-67; discussion, p. 67-70.

Various methods.

13-75. An Absolute Noise Thermometer for High Temperatures and High Pressures. J. B. Garrison and A. W. Lawson. *Review of Scientific Instruments*, v. 20, Nov. 1949, p. 785-794.

A null device for determining the ratio of two absolute temperatures with an accuracy of 0.1% is described. It balances mean-square fluctuations in voltage across the terminals of two resistors arising from thermal agitation at the temperatures to be compared. The ratio of resistances, when noise voltages from the two resistors are equal, determines the ratio of their absolute temperatures.

13-76. Novy presnejsi zpusob mereni licich teplot tavenych kovu. (A New and More Accurate Method for Determination of the Temperature of Molten Metals.) Zdenek Ryska. *Hutnické Listy*, v. 4, Sept. 1949, p. 273-276.

Method and apparatus based on electronic detection and measurement of infra-red radiation. Use of the method for determination of pouring temperatures.

13-77. Pyrometry and Temperature Control. M. W. Johns. *Canadian Metals and Metallurgical Industries*, v. 12, Nov. 1949, p. 20-23, 42-43.

No. 2 of series on fundamentals of metalworking.

SECTION XIV

FOUNDRY PRACTICE

14A—General

14A-1. On Accuracy of Sieve Analyses Made by Means of Sieving Machines. Sture Mörtsell. *Transactions of the Royal Institute of Technology,* No. 17, 1948, 43 pages.

Tests on various sets of sieves and sieving machines in the light of American and German standards. Important factors to be considered in sieve analyses. Emphasizes applications to foundry practice.

14A-2. Investment Castings Reproduce Accurate Details. Pat Dwyer. *Foundry,* v. 77, Jan. 1949, p. 98-99, 232.

Use of process for production of ornamental or artistic articles from metal in intricate detail.

14A-3. A Moulding and Core-Sand Development. W. Bullock and J. Finlay. *Foundry Trade Journal,* v. 85, Nov. 18, 1948, p. 481-482.

Describes use of pitch-bonded sands, for which cost and technical advantages are claimed, as well as reduction in fumes produced as compared with oil-bonded sand.

14A-4. Sealing Porous Castings. *Machinery Lloyd* (Overseas Edition), v. 20, Dec. 4, 1948, p. 103.

Use of vacuum-impregnation system, the pores being filled with resin.

14A-5. Developments in American Foundry Equipment. W. A. Turner. *Foundry Trade Journal,* v. 85, Nov. 25, 1948, p. 509-512.

14A-6. Adequate Dust Control for Foundries. B. F. Postman. *Heating and Ventilating,* v. 45, Dec. 1948, p. 65-70.

First of two-part article discusses the dust-control problem in a foundry, first from the standpoint of foundries in general and, second, from the standpoint of problems related to specific types and sizes of foundries.

14A-7. Mechanization Boosts Westinghouse Foundry Capacity. A. D. Stout, Jr. *Iron Age,* v. 163, Jan. 13, 1949, p. 54-57.

New equipment and procedures.

14A-8. Olivine Synthetic Moulding Sand Controls Silicosis. George Allen. *Canadian Metals and Metallurgical Industries,* v. 12, Jan. 1949, p. 19, 36.

Use instead of quartz sand, as developed in Norway.

14A-9. L'évolution du masselottage en fonderie; Solutions nouvelles. (Evolution of Feeder-Head Design for the Foundry; A New Solution.) Pierre Nicolas. *Fonderie,* Sept, 1948. p. 1293-1298.

The best solution of the problem can be achieved by a combination of surface heating by means of an exothermic substance and use of an exothermic core, thus permitting a decrease in feeder-head dimensions. 10 ref.

14A-10. Uses Standard Permanent Mold Equipment. *American Foundryman,* v. 15, Jan. 1949, p. 51. Based on talk by E. C. Hoenicke.

Equipment and procedures at Caton Mfg. Co., Detroit.

14A-11. Foundry Drying Systems. John B. Morton. *Foundry Trade Journal,* v. 85, Dec. 30, 1948, p. 619-626; v. 86, Jan. 6, 1949, p. 3-8.

The various types used for drying of core sand, cores, molds, and ladles.

14A-12. Effect of Varying Particle Size Distribution on Green Permeability and Strength of a Natural Molding Sand. Mary T. Zemantowsky and Alexander I. Krynitsky. *Foundry,* v. 77, Feb. 1949, p. 66-71, 272-273.

Albany sand was used as the basic material and test mixtures were prepared by making separate additions—10, 20, and 40%—of each of three selected sieve fractions of washed silica sand.

14A-13. Large Scale Production of Small, Intricate Castings. Robert H. Herrmann. *Foundry*, v. 77, Feb. 1949, p. 80-83, 172, 174-175, 178-179.

Procedures and equipment of Precision Metalsmiths, Cleveland, a comparatively new firm engaged in precision investment casting.

14A-14. Die Coatings for Copper-Base Alloy Permanent Mold Casting. James L. Erickson. *Foundry*, v. 77, Feb. 1949, p. 88-89, 180, 184, 187, 190, 192, 194, 196, 198.

Reasons for using die coatings and a few typical formulations.

14A-15. Core Baking; 2 Minutes v. 4 Hours. Victor E. Hillman. *Iron Age*, v. 163, Feb. 3, 1949, p. 116-121.

Baking cores in 2 min. through use of an electronic core-baking unit. Advantages are high-speed baking, small space requirements, lower baking temperature, better physical characteristics, and less gassing in the mold. Core mixes are also described.

14A-16. Etude de graphites pulvérulents comme isolants de fonderie. (Study of Powdered Graphite as an Insulating Material in the Foundry.) Pierre Nicolas. *Fonderie*, Oct. 1948, p. 1354-1356.

The properties and structure of different types of graphites were investigated with respect to their use as mold coatings. Includes X-ray diffraction patterns.

14A-17. Fabrication des diverses pieces d'un moteur a explosion. (Production of Miscellaneous Parts of Internal-Combustion Engines.) Jean Duport and Gabriel Joly. *Fonderie*, Oct. 1948, p. 1357-1360.

Choice of alloy and casting process (sand or chill). Tables show compositions of the different alloys tested and mechanical properties when cast by each of the above methods.

14A-18. Promoting Riser Fluidity. E. D. Boyle. *American Foundryman*, v. 15, Feb. 1949, p. 45-50.

Use of diatomaceous earth to control directional solidification in ferrous and nonferrous castings. Possible feeding methods and use as "hot-top" for Ni-Cu billets.

14A-19. Special Techniques Reduce Composite Casting Losses. Arthur K. Higgins. *American Foundryman*, v. 15, Feb. 1949, p. 54-57.

Previously abstracted from *Metal Progress*. See item 14a-173, 1948.

14A-20. (Book). **Development of the Metal Castings Industry.** Bruce L. Simpson. 246 pages. 1948. American Foundrymen's Society, 222 West Adams St., Chicago 6, Ill.

A pictorial story and commentary on the history and progress of the foundry. Facts and data upon which to build programs of public interest.

14A-21. (Book). **Metal Casting of Sculpture.** Carl D. Clarke. 175 pages. Standard Arts Press, Butler, Md. $6.50.

Procedures used in producing statuary and ornamental castings from original models by use of glue, flexible compound, agar, rubber, and resilient plastic molds. Includes formulas for materials, methods of preparation, and use. Other chapters relate to the roman joint, wax-resin and investment compounds; making the lost wax cast; metals and their alloys; furnaces; finishing the cast; defects and their repair; and metal coloring.

14A-22. Core Drying; Suitability and Efficiency of High Frequency Heating. F. Bird and J. Pound. *Metal Industry*, v. 74, Feb. 4, 1949, p. 83-85.

14A-23. Better Patching Improves Cupola Operation. Tom Barlow and E. W. Claar. *Foundry*, v. 77, Mar. 1949, p. 68-69, 254, 256, 258, 260.

Recommended procedures for greater uniformity and improved results.

14A-24. Thermoplastic Patterns. Thomas A. Dickinson. *Foundry*, v. 77, Mar. 1949, p. 160-162, 164.

Use of Plasticarve, a typical low-melting compound used in modeling or duplicating patterns.

14A-25. Investment Materials for Industrial Precision Casting. Thomas E. Moore. *Foundry*, v. 77, Mar. 1949, p. 196.

Properties and applications of low and high-temperature investment casting materials.

14A-26. Symposium on Foundry Dust Control. *American Foundrymen's Association*, June 1947, 24 pages.

Introduction and six papers on dust-control equipment and its maintenance.

14A-27. Shot Blasting; New Design of Airless Rotary Barrel Machine. *Iron and Steel*, v. 22, Feb. 1949, p. 58.

In this equipment for cleaning castings, no compressed air is used, the shot being projected upon the work by a high-speed impeller.

14A-28. Risering Castings. J. B. Caine. *American Foundryman*, v. 15, Mar. 1949, p. 46-55.

Scientific approach to the problem of gating and risering. Risering is divided into two phases, position-

ing and dimensioning. A basic risering system is proposed for positioning risers. Quantitative information derived from this system for any metal can be applied to any casting, no matter how complex. An equation for dimensioning risers. Numerical values of the constants for steel. 10 ref.

14A-29. Rapid Sand Permeability Calculation. D. S. Eppelsheimer and J. E. Reynolds. *American Foundryman,* v. 15, Mar. 1949, p. 56-57.

Presents nomograph and illustrates its use by application to the extreme cases of zero and infinite permeability.

14A-30. Modern Foundry Methods: Mixing-Applying Mold and Core Washes. *American Foundryman,* v. 15, Mar. 1949, p. 58-60. Based on paper by Robert B. Melmoth.

Methods used in a production foundry.

14A-31. Densified Wood Applied to Metal-Working Operations. *Machinery* (American), v. 55, Mar. 1949, p. 185-187.

Densified wood is wood impregnated with phenolic resin. Uses for patterns and molds; methods for machining and drilling the materials.

14A-32. Precision Casting With Frozen Mercury Patterns: The Mercast Process. Wm. I. Neimeyer. *Iron Age,* v. 163, Mar. 17, 1949, p. 94-97.

Castings weighing up to 60 lb., with tolerances of ±0.0015 in. per in., are now being produced by a process which makes use of frozen mercury for the pattern and a fired ceramic shell-like material for the mold.

14A-33. New Precision Casting Process Provides Better Finish, Closer Tolerances. Herbert Chase and Leslie T. Schakenbach. *Materials & Methods,* v. 29, Mar. 1949, p. 52-56.

"Mercast" process used by Sperry Gyroscope Co.—a variation of precision casting in which frozen mercury replaces the wax most generally used in investment casting. Highly accurate aluminum and stainless steel precision castings are thus produced.

14A-34. Einfluss von Kohlenstaubzusätzen zum Formsand (NE-Guss). (The Effect of Coal Dust in Molding Sand (NE-Casting).) Edmund T. Richards. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Nov. 1948, p. 147-148.

Desirable effects of hard-coal dust and sawdust in molding sand on appearance and quality on the basis of moisture content, compressive strength, and gas permeability of molds containing these ingredients.

14A-35. Kernbinder, ihre Natur, Anwendung und Ueberwachung. (Core Binders; Their Nature, Use, and Control.) Wilhelm Werner Magers. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 10-13.

Core oils, core emulsions, dry binders, wet binders, synthetic resin binders (Croning process), the lost-wax process, and methods of testing core binders for proper control.

14A-36. Konstruktions- und Modellgestaltung. (Pattern Design and Construction.) J. Hagen. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 14-19.

The importance of considering basic physical laws in the design of castings and the importance of close cooperation between the designer and the foundryman to reduce rejects and pattern costs.

14A-37. Sable synthétique. (Synthetic Sand.) Gabriel Joly. *Fonderie,* Dec. 1948, p. 1417-1419.

Use of synthetic molding sand consisting of silica sand and colloidal clay in amounts varying between 3 and 8% (depending on the quality of the clay). Advantages and method of production.

14A-38. (Book.) **Die-Casting Machines.** Rev. ed. 52 pages. Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. 3s., 6d.

Features of the modern die-casting machine in its various types and modifications, including goose-neck machines, both plunger and air operated, cold-chamber machines, and machines for special purposes. Short history of the early development of the die-casting machine.

14A-39. Investment Casting on a Shoestring. K. W. Thompson. *American Machinist,* v. 93, Mar. 24, 1949, p. 104-105.

How the four essential units of equipment—wax injector, centrifuge, furnace and oven—were made for less than $1000. Also how to use them.

14A-40. Foundry Techniques Are Challenge to Patternmaker. Frank C. Cech. *Foundry,* v. 77, Apr. 1949, p. 78-81, 226.

A series of patterns submitted in a contest.

14A-41. Effect of Cellulose Materials on Foundry Sands. Tom Barlow and C. P. Loucks. *Foundry,* v. 77, Apr. 1949, p. 82-84, 243-245.

Experimental data obtained during studies at Battelle Memorial Institute and Harry W. Dietert Co.

14A-42. Casting Matchplates in Plaster. David C. McConnell. *Canadian Metals and Metallurgical Industries,* v. 12, Mar. 1949, p. 18-19, 36.

Process for producing "multiple-pattern" match plates from one master pattern, using the plaster molding process.

14A-43. Cores, Core-Making and Core-Making Materials. J. G. Gilbert. *Foundry Trade Journal,* v. 86, Feb. 17, 1949, p. 133-137; Feb. 24, 1949, p. 155-158.

For a foundry which makes miscellaneous castings.

14A-44. Powdered Graphite in Foundry Practice. P. Nicolas. *Foundry Trade Journal,* v. 86, Feb. 24, 1949, p. 160-161. Translated from *Fonderie.*

Results of X-ray examination of the structure of graphites from Brazil, Italy, Madagascar, and Morocco. Recommendations concerning the best graphite for different foundry applications, on the basis of structure observed.

14A-45. The Mechanics of Moulding-Sand Properties. Archibald Jamieson. *Foundry Trade Journal,* v. 86, Mar. 3, 1949, p. 183-184.

Limitations of orthodox sand testing, which does not tell to what extent the sand is moldable. The nature of sand movement during ramming and distortion during compression testing. Relationship of "flowability" determined by different methods to molding operations. A unit of ramming work to cause distortion of a definite amount in a given volume of weight or sand is proposed. Use to compare moldabilities is believed feasible.

14A-46. Application of Hydraulic Calculations to the Design of Pouring Gates for Castings. J. Kieswetter. *Engineers' Digest,* v. 10, Feb. 1949, p. 47-50. Translated and condensed from *Hutnické Listy* (Metallurgical Topics), v. 3, June 1948, p. 165-170.

Previously abstracted from original. See item 14a-142, 1948.

14A-47. Synthetic Resin Core Binders. G. L. Harbach. *Foundry Trade Journal,* v. 86, Mar. 10, 1949, p. 203-208; Mar. 17, 1949, p. 225-229; discussion, p. 229-233.

An investigation of the properties of synthetic resins as core binders.

14A-48. Worker Effort Reduced by Foundry Mechanization. Eugene C. Zack. *Production Engineering & Management,* v. 23, Apr. 1949, p. 65-66.

14A-49. (Book) **Modern Metal Production.** J. W. Day, editor. 122 pages. 1947. Distributed by New World Publications, P.O. Box 1221, Los Angeles 53, Calif. (Compiled in Europe and printed in England.)

Historical, commercial and technical aspects of continuous casting. Notes on centrifugal casting, powder metallurgy, impact extrusion. immersion casting, and the pre-refining of molten substances. 23 ref.

14A-50. Causes of Rat-Tail Casting Defects. *American Foundrymen's Society,* Preprint 4, 1949, 9 pages.

Final report of A.F.S. committee on physical properties of iron-foundry molding materials at elevated temperatures. Details of work on five sands which had caused trouble. Effects of ingredients added in attempts to eliminate the difficulties. Appendix discusses the expansion test for molding sands.

14A-51. Design and Operation of a 10-in. Diameter Cupola. D. E. Krause and H. W. Lownie, Jr. *American Foundrymen's Society,* Preprint 12, 1949, 9 pages.

Cupola has been successfully operated for over three years. It was designed to reproduce large commercial units as closely as possible in all respects except size. Research investigations on effects of moisture in the blast, effects of rusty scrap in the charge, relative refractoriness of various lining materials, and comparisons of the operating characteristics of different foundry cokes. Details of construction, and some modifications for special purposes.

14A-52. Plastic Binders for Foundry Sand Practice. H. K. Salzberg. *American Foundrymen's Society,* Preprint 18, 1949, 9 pages.

Principles useful in formulating core sand mixes with plastic binders. Means of improving green strength and workability of core sand mixes. Both urea and phenol resin types of binder were investigated. Types of castings particularly improved by use of plastic-bonded cores. 13 ref.

14A-53. Casting Surface Finish. H. H. Fairfield and J. MacConachie. *American Foundrymen's Society,* Preprint 24, 1949, 5 pages.

Surface finish is measured by weighing a test casting, buffing it to a smooth finish, and reweighing the casting. The loss in weight is used as an index of casting finish. Experiments are limited to the casting of 85-5-5-5 bronze into No. 1 Albany natural molding sand. The effect of mold hardness, moisture content, metal temperature, and method of filling the flask.

14A-54. Modern Foundry Core and Mold Ovens. Charles A. Barnett. *American Foundrymen's Society,* Preprint 36, 1949, 21 pages.

Advantages of proper selection of this equipment.

14A-55. A Study of the Principles of Gating. R. E. Swift, J. H. Jackson, and L. W. Eastwood. *American Foundrymen's Society,* Preprint 55, 1949, 13 pages.

Equipment and procedure using motion-picture photography of the flow of water through lucite pouring boxes, sprues, and into lucite molds. Bubble formation in such systems is believed to give some indication of gas entrainment to be expected in actual casting practice and to show how it may be minimized by design modifications. Study of effects of porosity made by drilling tiny holes in the mold walls at various points. Recommendations for changes in gating-system design. 11 ref.

14A-56. Le bentoniti e le argille in fonderia. (Bentonite and Clay in the Foundry.) Pietro Rossignoli. *La Metallurgia Italiana,* v. 41, Jan.-Feb. 1949, p. 19-22.

Some of the properties of bentonite from different sources and with different swelling powers were examined in order to determine relationships between the gel-forming power of the bentonite and the cohesive properties of the synthetic sand produced. It was concluded that there is no relation between the two properties.

14A-57. Expanding Research Program Advances Foundry Industry. *American Foundryman,* v. 15, Apr. 1949, p. 66-72.

AFS-sponsored research program in foundry fundamentals being conducted as eight projects at various U. S. and Canadian technical institutions.

14A-58. 6 Ways to Mechanize a Foundry. Henry W. Zimnawoda. *American Foundryman,* v. 15, Apr. 1949, p. 79-90.

14A-59. Foundry Practice. N. H. Keyser. *Metals Review,* v. 22, Apr. 1949, p. 5-7.

New developments of 1948, giving references to "A.S.M. Review of Metal Literature."

14A-60. A Practical Method for Determining Heat Abstraction by Molding Materials. T. T. Rick. *Iron Age,* v. 163, Apr. 21, 1949, p. 74-77.

Simple, practical method using a standard cup mold in which two thermocouples are embedded. Results of the use of this test on eight molding-sand mixes and cast iron.

14A-61. Electric Motors in Engineered Production. Paul Graham. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 66-69, 90-91.

Equipment and procedures. Foundry, press, and machining operations.

14A-62. Casting Inspection. J. Howard Williams. *Foundry Trade Journal,* v. 86, Apr. 7, 1949, p. 303-312; Apr. 14, 1949, p. 341-349; Apr. 21, 1949, p. 365-368.

Composed of a number of opinions, descriptions of methods, criticisms, relative to many aspects of casting inspection in the small general foundry where high-grade metals and intricate precision castings are produced in small or medium batches; it does not attempt to cover problems peculiar to mass production in fully mechanized foundries.

14A-63. Precision Casting. Alan Whittaker. *Machinery* (London), v. 74, Apr. 21, 1949, p. 514-516.

The lost-wax process used in the manufacture of rotor and compressor blades for gas turbines.

14A-64. Economics of Castings and Weldings. E. C. Moore. *Machinery* (London), v. 74, Apr. 21, 1949, p. 517-519.

Products considered are limited to machine frames and members within the weight range of 10-35 tons, including those for accurate machine tools and semifinishing machines.

14A-65. Atlas of Defects in Castings. Series I. Ed. 2. *Institute of British Foundrymen,* 1948, 34 pages.

40 different types of defects. Causes and suggested remedies.

14A-66. Cast Laminated Metallic Materials. J. S. Vanick. "Engineering Laminates" (John Wiley & Sons, 1949) p. 463-482.

Chill-cast metal; chill or sand-cast duplex metal; solidified casting surface coated with liquid metal; casting surface coated by absorption of alloys; and weld-coated, spray-coated, dip-coated, and electroplated casting surfaces. Applications.

14A-67. Ohio Foundry Sands. Douglas C. Williams. *Engineering Experiment Station News* (Ohio State University), v. 21, Apr. 1949, p. 7-10.

Results of survey and of laboratory investigation.

14A-68. High Production Patterns. V. J. Sedlon. *American Foundryman,* v. 15, May 1949, p. 54-57.

Principles of pattern design, and methods of patternmaking, applicable to mass production. For small orders conventional methods are still satisfactory, but for long runs, use of modern methods is essential for reduction of time and costs.

14A-69. Wet System Reclaims Foundry Sand. Roy W. Bennett. *American Foundryman,* v. 15, May 1949, p. 58-61.

System and comparative cost analysis.

14A-70. Dielectric Core Baking. J. Wesley Cable. *American Foundryman,* v. 15, May 1949, p. 99-104.

Equipment, procedures, advantages, and applications.

14A-71. Heat Abstraction by Molding Materials. Thad T. Rick. *Foundry,* v. 77, June 1949, p. 96-97, 182, 184, 186, 188.

Previously abstracted from *Iron Age,* item 14A-60, 1949.

14A-72. Procedure for Making Castings of Uniform Thickness From Block Patterns. *Foundry,* v. 77, June 1949, p. 121.

14A-73. Welding Rods Cast in Graphite Molds. *Foundry,* v. 77, June 1949, p. 220.

14A-74. Die neues Giesserei-Ultraschallgerät. (A New Ultrasonic Generator for Foundry Use.) Friedrich Vogel. *Metall,* July 1948, p. 229-230.

Metallographic examinations have shown that alloys melted under ultrasonic vibration produced by this generator have perfectly homogeneous and fine-grained structures.

14A-75. Views on Precision Casting. *Foundry Trade Journal,* v. 86, May 26, 1949, p. 501-503.

Summarizes paper by J. J. Marais and accompanying discussion, presented at February meeting of South American Branch of Institute of British Foundrymen. Clifford Shaw discussed use of ethyl silicate in the foundry.

14A-76. Les advantages de la recirculation des gaz chauds dans une étuve de fonderie. (Advantages of Hot Gas Recirculation in Mold Drying Ovens.) Pierre Rigaut and Georges Ulmer. *Fonderie,* Feb. 1949, p. 1491-1493.

Drying ovens with and without hot-gas recirculation were comparatively investigated for different types of fuel. On the basis of results, the above type of oven is particularly recommended when crude oil or gas is used and for electric drying.

14A-77. Die Kerntrocknung. (Core Drying.) Josef Kupper. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Mar. 1949, p. 78-85.

A study of the behavior of different types of cores while drying and of various methods and types of core-drying equipment.

14A-78. Specialanlagen zur Trocknung von Giessereisand. (Special Plants for Drying Foundry Sand.) J. Kesper. *Archiv fur Metallkunde,* v. 3, Feb. 1949, p. 78-82.

Different types and their economic efficiency. Several modern sand-drying plants.

14A-79. (Book) **Bibliography on Precision Investment Casting by the Lost Wax Process.** ESL Bibliography No. 3, 1949, 15 pages. Engineering Societies Library, 29 West 39th St., New York 18, N. Y.

Annotated bibliography of 111 selected references up to early 1949, includes theory, design problems, specific industrial applications, and factory and production methods. Some historical references.

14A-80. (Book) **Osnovy Tsentrobezhnogo Lit'yr.** (Fundamentals of Centrifugal Casting.) P. G. Novikov, S. E. Rosenfeld, N. I. Klochnev, and V. N. Saveiko. 183 pages. 1947. Government Scientific-Technical Publishing House for Mechanical Engineering Literature, Moscow, U.S.S.R.

Compiled from domestic and foreign sources. The theory is analyzed. The influence of centrifugal force on the quality of finished products. Practical problems of centrifugal casting. 21 ref.

14A-81. On Accuracy of Sieve Analyses Made by Means of Sieving Machines. (In English.) Sture Mörtsell. *Acta Polytechnica* (Mechanical Engineering Series), v. 1, No. 6, 1949, 45 pages.

Previously abstracted from *Transactions of the Royal Institute of Technology,* item 14A-1, 1949.

14A-82. Radioisotope Gage Indicates Liquid Metal Height in Cupolas. Don M. McCutcheon. *American Foundryman,* v. 15, June 1949, p. 35-39.

Method for continuous indication, using cobalt 60. Variations in design will permit indication of a single level, multiple levels, or continuous indication at all times during the melting and pouring cycle.

14A-83. Friction Saw Cuts Castings Cleaning Cost. H. J. Chamberland. *American Foundryman,* v. 15, June 1949, p. 44-47.

Techniques, applications, and advantages.

14A-84. Cast Figure Process Reduces Machining Costs. George Krumlauf. *American Foundryman,* v. 15, June 1949, p. 50-52.

Process and its applications. Use of molds thus manufactured is becoming more common in the processing of glass, plastics, and light metals. Molds, rings, plungers, valves, forming equipment, and similar parts manufactured by this method are found to have excellent life.

14A-85. Foundry Data: Collecting; Organizing; Analyzing. W. K. Bock. *American Foundryman,* v. 15, June 1949, p. 53-56.

Application of statistical methods.

14A-86. Centrifugal Casting Welding Rods. M. W. Williams. *Steel,* v. 124, June 20, 1949, p. 98-99.

Methods and equipment for making rods used in facing rock bits. Cast-iron permanent chill molds are used. Fewer misruns and other difficulties result from this method than from conventional casting.

14A-87. Core-Making at Coneygre Foundry. A. R. Parkes. *Foundry Trade Journal,* v. 86, June 9, 1949, p. 543-547.

Development and use of a quick-drying core binder.

14A-88. Naturally-Bonded Versus Synthetic Sands. *Foundry Trade Journal,* v. 86, June 9, 1949, p. 553-556.

A general discussion opened by remarks of J. J. Sheehan and W. B. Parkes, the former of which favored natural sands and the latter, the synthetic type.

14A-89. Precision-Cast Milling Cutters Could Solve a Crisis. John H. Penrose and Catherine T. Amond. *American Machinist,* v. 93, July 14, 1949, p. 89-93.

Procedure for precision-casting cutter from tool scrap. Results of laboratory machining tests indicate that performance of the cast cutters is superior to that of the forged cutters.

14A-90. Mechanized Units Installed by Textile Machine Works Foundry. William G. Gude. *Foundry,* v. 77, July 1949, p. 82-87.

Equipment and procedures for ferrous and nonferrous foundry work.

14A-91. Innovations in Investment Casting Cut Cost of Finished Parts. *Production Engineering & Management,* v. 24, July 1949, p. 58-59.

Procedure used by Precision Metalsmiths, Inc., for making castings by the investment method, which greatly reduces requirements for machine finishing. Illustrated.

14A-92. Precision Investment Molding Process. J. H. Wernick. *U. S. Atomic Energy Commission,* AECD-2439, Mar. 17, 1947, 14 pages.

Details of the process, especially as applied during the war to the casting of Vitallium turbosupercharger blades. 10 ref.

14A-93. Moulding Practice. *B.S.F.A. Bulletin,* v. 1, May 1949, p. 1-7.

Recommended procedures for sand control, the centrifugal process, the lost-wax process, strickle molding, stack molding, and mold drying. Discusses mold washes.

14A-94. Les argiles colloidales Francaises et leurs applications a la preparation des sables synthetiques. (French Colloidal Clays and Their Application in Preparation of Synthetic Molding Sands.) Pierre Nicolas. *Fonderie,* Mar. 1949, p. 1510-1520; Apr. 1949, p. 1545-1553.

The above was investigated for 18 different types. Applicability of each for use as a basic material for synthetic sand is indicated.

14A-95. Mesure des débits d'air soufflés au cubilot. (Determination of the Rate of Air Flow in a Cupola.) Henry Gernelle. *Fonderie,* Apr. 1949, p. 1554-1558.

Comparative analysis results in recommendation of the Pitat-Ritter device. Details of construction of the latter and optimum conditions of operation.

14A-96. Middelen ter bestrijding van krimpholten in gietstukken. (Means of Avoiding Shrinkage Cavities in Castings.) M. Stap. *Metalen,* v. 3, Mar. 1949, p. 149-153; *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Mar. 1949, p. 1-4.

Practical recommendations.

14A-97. Onderzoek en controle van vormzand. (Testing and Control of Molding Sand.) M. Stap. *Metalen,* v. 3, Apr. 1949, p. 175-181; also *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Apr. 1949, p. 5-10.

Methods for controlling the moisture content, granulation, gas permeability, and strength of sand molds.

14A-98. Eine neue Steuervorrichtung an Ruttel-Press-Formmaschinen. (A New Control Device for the Jolt-Squeeze Machine.) Wilh. Alb. Besserdich. *Die Neue Giesserei,* v. 36, (new ser., v. 2), June 1949, p. 184-185.

A device that protects both operator and pattern from injury.

14A-99. Precision Investment Casting. Albert W. Merrick. *Metal Progress,* v. 56, July 1949, p. 53-57.

Limitations; mechanical properties and their consistency among bars from the same cast and casts from a series of heats; melting and casting methods; and economics.

14A-100. Stop Metal Losses and Watch Costs Go Down. A. D. Barczak. *American Foundryman,* v. 16, July 1949, p. 50-55.

Various avenues for loss of metal in the foundry and recommendations for their reduction.

14A-101. Heat Transfer—A Foundryman's Tool. Victor Paschkis. *American Foundryman,* v. 16, July 1949, p. 59-63.

In the first part, the elements of heat flow are presented in simple and readily understandable terms. In the second part, foundry practice is examined from the thermal viewpoint. In the third part, the electric analogy method is briefly explained. 12 ref.

14A-102. Production and Consumption of Heat in the Cupola. *Industrial Heating,* v. 16, July 1949, p. 1182, 1184. Condensed from paper by D. W. Gunther.

A number of theoretical calculations relating fuel quality to cupola performance.

14A-103. Role of Gas in Development of Precision Casting Industry. Cornelius Ackerson. *Industrial Gas,* v. 28, July 1949, p. 5-6, 26-28.

Equipment and procedures.

14A-104. Intricate Parts for Jet Engines Cast by the Lost Wax Method. George H. DeGroat. *Machinery,* v. 55, July 1949, p. 188-193.

Using stellite, inconel, monel, nickel, and similar alloys.

14A-105. Jet-Engine Components Cast Centrifugally in Permanent Molds. Thomas S. Quinn, Jr. *Machinery,* v. 55, July 1949, p. 194-199.

Using "Centri-Die" process.

14A-106. Ethyl Silicate; Applications to Specialized Foundry Problems. D. F. B. Tedds. *Metal Industry,* v. 75, July 8, 1949, p. 27-30, 33.

Production from metallic silicon and uses in precision casting, as a mold or core dressing, for bonding furnace linings, and in the production of cores. Details of compounding and procedures.

14A-107. Casting Design as Influenced by Foundry Practice. Oliver Smalley. *Foundry Trade Journal,* v. 87, July 21, 1949, p. 91-94; discussion p. 94-95.

Some rules for designers of castings.

14A-108. Precision Toolmaking Via "Lost-Wax" Casting. A. E. Rylander. *Tool Engineer,* v. 23, Aug. 1949, p. 42-43.

Steps involved. Advantages which include casting to close limits of tolerance and infinite duplication of parts.

14A-109. New Pattern Material Has Unusual Characteristics. *Foundry,* v. 77, Aug. 1949, p. 152, 154.

Properties and applications of densified wood.

14A-110. Compressed Air; Use in a Production Foundry. *Foundry,* v. 77, Aug. 1949, p. 164, 166.

14A-111. Electric Ingot Process Saves Strategic Alloys. E. S. Kopecki. *Iron Age,* v. 164, Aug. 18, 1949, p. 81-87.

Application to the manufacture of high-temperature alloys results in a considerable saving of virgin elements, when compared with current melting practice. Results of a study of relative consumption of Cr, Ni and Mo in the manufacture of 16-25-6 alloy. Significant features of the new six-mold production machine.

14A-112. An Approach to New Developments in Casting Control. H. H. Harris. *Metal Progress,* v. 56, Aug. 1949, p. 222-224.

The Navy began a research program in June 1947 at Alloy Engineering & Casting Co.'s plant in Champaign, Ill., directed toward experimental production of intricate and highly accurate parts for high-temperature service. Fundamental considerations involved and fruitful lines of inquiry decided upon on the basis of these considerations.

14A-113. Moisture in Bentonite Influences Strength. Bradley H. Booth. *American Foundryman,* v. 16, Aug. 1949, p. 50-51.

Investigated for four different bentonites.

14A-114. Evolution of Investment Casting. *Industrial Heating,* v. 16, Aug. 1949, p. 1378. Condensed from paper by Albert W. Merrick.

See abstract from *Metal Progress,* item 14A-99, 1949.

14A-115. Sand Core Baking by Dielectric Heating. Ben Griffith. *Western Metals,* v. 7, Aug. 1949, p. 26-29.

14A-116. Experiences with Ethyl Silicate in the Foundry. D. F. B. Tedds. *Engineering,* v. 168, July 29, 1949, p. 101-102. A condensation.

See abstract from *Metal Industry,* item 14A-106, 1949.

14A-117. Moulages par noyaux extérieurs résistants et très perméables. (Casting in Molds With Extremely Permeable Cores but Tough External Surfaces.) Pierre Nicolas. *Fonderie,* May 1949, p. 1589-1591.

Two types of molds having the above properties are cement-sand and silicate-sand. Chemical compositions and methods of production, as well as recommended casting methods.

14A-118. Modelle, Modellplatten und Kernkasten aus Aluminiumgusslegierungen. (Patterns, Pattern Plates, and Core Boxes for Cast Aluminum Alloys.) H. Reininger. *Die Neue Giesserei,* v. 36 (new ser., v. 2), July 1949, p. 199-204.

Arguments for replacing wood by Al alloys for patterns and core boxes. 12 ref.

14A-119. Casting Surface Finish. H. H. Fairfield and J. MacConachie. *Canadian Metals and Metallurgical Industries,* v. 12, Aug. 1949, p. 18-19, 32, 34.

Previously abstracted from *American Foundrymen's Society,* Preprint 24, 1949. See item 14A-53, 1949.

14A-120. Which Comes First—Core Oil or Water? O. J. Myers. *Foundry,* v. 77, Sept. 1949, p. 75, 190.

Influence on core-sand properties of variations in both the order in which different ingredients are added to the mix, and the total mixing time.

14A-121. Care of Molding Machines. Raymond Shire. *Foundry,* v. 77, Sept. 1949, p. 89, 148, 150.

Points to be observed in the proper maintenance of molding machines.

14A-122. Silicone Compounds Adapted to Foundry Use. Thomas A. Dickinson. *Foundry,* v. 77, Sept. 1949, p. 180-182.

A variety of new applications in the foundry. Use to permit die casting of steel, as bonding agents for molding and core sands, as mold-facing materials, as plasticizers for the flexible molds used with low-melting alloys, and as sealants for the pores of metallic castings. Characteristics of a series of Dow-Corning silicone fluids.

14A-123. Symposium on Running Methods. The Connor Runner. J. F. Measures. **The Distributed Runner.** P. A. Russell. **Running and Feeding of Non-Ferrous Castings.** D. W. Berridge. *Foundry Trade Journal,* v. 87, Aug. 11, 1949, p. 169-174; discussion, p. 174-176.

Various arrangements devised for conducting molten metal into the mold. Examples of castings made by use of these systems.

14A-124. Production Processes—Their Influence on Design. Part XLVI. Centrifugal Casting. Roger W. Bolz. *Machine Design,* v. 21, Sept. 1949, p. 107-112.

14A-125. Contribution au développement des applications de la centrifugation en fonderie. (Contribution to the Development of Centrifugal Casting.) Pierre Lefranc. *Fonderie,* June 1949, p. 1609-1616; discussion, p. 1616-1617.

Methods used in France for centrifugal casting of iron, special and malleable cast iron, ordinary and special steels, bronzes and brass, and aluminum. The theory of centrifugal casting is explained by a series of schematic drawings.

14A-126. Giess- und Anschnittfragen in Giessereien. (Pouring and Tapping Problems in Foundries.) E. Diepschlag. *Metall,* July 1949, p. 215-219.

Rate of flow from tilting and bottom-tap ladles is calculated. Relationship between flow conditions in the gates and rates of flow as well as the effects of potential and kinetic energies on the quality of the casting. Shows that the fluidity test is an important foundry method.

14A-127. Richtig formen! Das Verhalten von "Luft" in Formen und Kernen. (Proper Molding! The Effect of "Air" in Molds and Cores.) W. Kohler. *Archiv für Metallkunde,* v. 2, no. 7, 1948, p. 230-237.

Principles of mold and core design to ensure that air does not become entrapped.

14A-128. Molding Sand Standardized. James J. Silk. *American Foundryman,* v. 16, Sept. 1949, p. 51-53.

Advantages of standardized sand, optimum proportion of sea coal, need for adequate venting and for periodic sand checking.

14A-129. Modern Foundry Methods. *American Foundryman,* v. 16, Sept. 1949, p. 54-56.

Unusual variation of the lost-wax process using a frozen mercury pattern instead of the traditional wax. Producing precision castings of complex form with dimensional tolerances of ±0.003 in. in 1½ in. is common. Bulk of the castings produced have been of Al-Si alloy; some stainless steel and coin-silver castings have also been made.

14A-130. Advantages Gained by Precision Casting Wide Range of Steels and Alloys. K. J. Yonker. *Materials & Methods,* v. 30, Sept. 1949, p. 82-84.

Precision casting is useful for high production of many low-cost metals as well as for fabrication of intricate parts.

14A-131. Experiences With Ethyl Silicate in the Foundry. D. F. B. Tedds. *Foundry Trade Journal,* v. 87, Sept. 1, 1949, p. 281-286; Sept. 8, 1949, p. 315; discussion, p. 315-317.

Previously abstracted from *Metal Industry.* See item 14A-106, 1949.

14A-132. Synthetic Resins in the Foundry. K. S. Meakin. *Foundry Trade Journal,* v. 87, Sept. 8, 1949, p. 307-312.

Some recent developments in core practice.

14A-133. Precision Casting of Hard-to-Machine Metals With Polystyrene

Patterns. *Automotive Industries,* v. 101, Oct. 1, 1949, p. 44, 58.

Method for producing a variety of parts which cannot be made by conventional methods of forging or machining.

14A-134. Effect of Grain Shape on the Behaviour of Synthetic Core and Moulding Sands. W. J. Rees. *Foundry Trade Journal,* v. 87, Sept. 22, 1949, p. 359-366; discussion, p. 366-369.

Use of a recently developed method for the assessment of grain shape. Typical examples of effect on bonded-sand mixtures.

14A-135. Statistical Quality Control—A New Tool for the Foundryman. H. H. Johnson and G. A. Fisher. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 194-206; discussion, p. 206-207.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-7. See item 14a-71, 1948.

14A-136. Changes in Chemistry of Liquid Steel in Contact With Sand. J. B. Caine. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 260-262; discussion, p. 262-263.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-29. See item 14a-75, 1948.

14A-137. Relation of Cupola Research Progress in Cast Iron Development. R. G. McElwee. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 264.

Progress on coke-quality and slag-fluidity testing.

14A-138. A Study of Factors Affecting Pouring Rates of Castings. J. G. Mezoff and H. E. Elliott. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 279-284; discussion, p. 285.

See abstract from *American Foundryman,* item 14a-81, 1948.

14A-139. Modernization of the "Small" Foundry. Lester B. Knight. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 297-312; discussion, p. 312-314.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-53. See item 14a-79, 1948.

14A-140. Eighth Annual Report on the Investigation of Properties of Steel Sands at Elevated Temperatures. J. P. Fraser and P. E. Kyle. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 345-354.

Covers work completed during the past year at Cornell University. Part I: data on hot compressive strength vs. test temperature for six sand mixtures. Part II: results to date on studies of hot compressive strength vs. exposure time for the 4% western bentonite mixture and the 10% fireclay mixture, each containing 5% moisture and a base sand of N. J. No. 60. These data are being analyzed in order to establish a recommended procedure for hot compressive strength tests at elevated temperatures. Part III summarizes results.

14A-141. Heat Transfer: A.F.S. Committee Report. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 363-378; discussion, p. 378-381.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-17. See item 14a-72, 1948.

14A-142. A New Permeable Metal Casting Plaster. K. A. Miericke and E. S. Johnson. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 479-485; discussion, p. 485.

New type of highly permeable gypsum metal-casting plaster. Advantages include: obtainability of any desired degree of permeability; need for complete mold dehydration eliminated; lower "burnout" temperatures possible; good mold strength in both wet and "burnout" stages; fuel and time economy; and greater operational flexibility.

14A-143. A Theoretical Approach to the Problem of Dimensioning Risers. J. B. Caine. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 492-497; discussion, p. 498-501.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-36. See item 14a-76, 1948.

14A-144. Surface Gas Pressure of Molding Sands and Cores. H. W. Dietert, H. H. Fairfield, and F. S. Brewster. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 528-535; discussion, p. 535.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-39. See item 14a-78, 1948.

14A-145. A Suggested Method for the Determination of Coke Reactivity to Carbon Dioxide at Combustion Temperatures. H. Edward Flanders. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 555-560; discussion, p. 560-562.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-37. See item 14a-77, 1948.

14A-146. Designing Strainer Cores. H. L. Campbell. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 574-575; discussion, p. 575.

Previously abstracted from *American Foundryman.* See item 14a-97, 1948.

14A-147. Core Box Designing and Rigging for Core Blowing. H. J. Jacobson. *Transactions of the American Found-*

rymen's Society, v. 56, 1948, p. 602-606; discussion, p. 606.

See abstract from *American Foundryman,* item 14a-138, 1948.

14A-148. The Development of Foundry Sand Control. G. L. Harbach. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B22-B32.

Previously abstracted from *Foundry Trade Journal.* See item 14c-22, 1948.

14A-149. Dry-Sand Patterns. James Timbrell. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B54-B58.

Application of sand patterns, tools required, making a connection casting, making a junction piece, and a typical repair casting.

14A-150. The Metallurgist in the Foundry. W. H. Salmon. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B82-B89.

Typical examples illustrate the ways in which metallurgists have cooperated with molders working in different metals to prevent gasholes and hot tears and to improve the surface appearance of castings.

14A-151. Problems in a Quantity Production Foundry. J. Hird. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B90-B96; discussion, p. B96-B97.

Previously abstracted from *Foundry Trade Journal.* See item 14a-58, 1948.

14A-152. Venting of Cores and Moulds. D. Killingworth. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B98-B103.

Previously abstracted from *Foundry Trade Journal.* See item 14a-90, 1948.

14A-153. The Measurement and Characteristics of Casting Fluidity. V. Kondic. *Metallurgia,* v. 40, Sept. 1949, p. 246-248.

Factors on which measurements of fluidity depend. Suggests that two tests should be developed, to determine metal fluidity or flowing power, and ability to fill a mold, respectively.

14A-154. Modern Foundry Methods. *American Foundryman,* v. 16, Oct. 1949, p. 33.

Use of downgate cores. Combination of runner cup and the downgate in a single unit makes it possible to produce downgates of uniform quality at a cost less than the combined cost of the sand pouring cup and sand downgate formerly used.

14A-155. Production Processes; Their Influence on Design. Part XLVII. Permanent-Mold Casting. Roger W. Bolz. *Machine Design,* v. 21, Oct. 1949, p. 115-121.

14A-156. Plaster Mold Casting of High Speed Impellers. Herbert Brecht. *Tool Engineer,* v. 23, Oct. 1949, p. 17-18.

Details of casting to tolerances as small as 0.005 in. and surface finishes of 30 rms., once regarded as beyond the scope of practical foundry operations, now being accomplished on a production basis.

14A-157. (Book) **Tierras de Moldeo.** (Molding Sands.) Ed. 2. J. Navarro Alcacer. 114 pages. 1949. Editorial Tecnos, S. A., Madrid, Spain.

Discusses molding sands and their properties on the basis of research undertaken at Spain's Iron and Steel Institute and the literature. Covers the properties of foundry molding sands found in Spain, the U. S., Germany, England, and France.

14A-158. Automatic Molding Machine. *Heating and Ventilating,* v. 46, Oct. 1949, p. 74-75.

Self-contained molding machine performing all the functions and operations required to produce molds, from introduction of the sand ingredients through completion of multiple molds stacked six high ready for pouring.

14A-159. Plastic Foundry Matchplates. Franz Schumacher. *Modern Plastics,* v. 27, Nov. 1949, p. 95-97, 100.

Methods of production and advantages.

14A-160. Centrifugal Tubular Castings for Industry. Earl M. Anger. *Iron and Steel Engineer,* v. 26, Oct. 1949, p. 90-94; discussion, p. 94-95.

Advantages and present and potential applications. Value of the oriented macrostructure for many applications.

14A-161. Réalisation d'un dispositif de meulage dans le vide par meule à grande vitesse, avec controle simultané des surfaces par diffraction électronique. (Development of an Apparatus for High-Speed Vacuum Casting With Simultaneous Control of Surface Quality by Electron Diffraction.) R. Courtel and R. Leger. *Journal des Recherches du Centre National de la Recherche Scientifique,* no. 7, 1948, p. 161-167.

Device designed for the study of cast surfaces during their solidification under high vacuum. Typical results for mild steel.

14A-162. Auswertung der Siebanalysen von Form- und Kernsanden. (Evaluation of the Sieve Analyses of Welding and Core Sands.) Wilhelm Bültmann. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Sept. 1949, p. 264-266.

Graphical method.

14A-163. Ueber die Festigkeit von Kernen in hoher Temperatur. (The Strength of Cores at Elevated Temperatures.) Franz Roll. *Die neue Giesserei,* v. 36 (new ser., v. 2), Sept. 1949, p. 266-269.

Experimentally determined strengths of cores of different compositions. Nonshrinking cores and effect of the allotropic transformation of quartz.

14A-164. An "Ideal" Foundry: Plant, Equipment, and Process Machinery. W. A. Turner. *Metal Industry,* v. 75, Oct. 14, 1949, p. 337-341.

Such a foundry, combining all of the features considered "ideal" does not exist, but the recommendations are believed to be of value in planning and selection of new equipment.

14A-165. Work of the Lake & Elliot Foundry Technical Committee. L. W. Sanders, C. H. Kain, R. J. Hart, W. L. Hardy, and J. W. Gardom. *Foundry Trade Journal,* v. 87, Oct. 20, 1949, p. 481-490; Oct. 27, 1949, p. 513-518; discussion, p. 518-520, 527.

Monthly examination of statistics in an iron and steel foundry. Research on cast steel test-bars, and attempts made to establish a reliable and workable machinability test suitable for use by foundries. Development and use of coated molding sands and resin-bonded core sands.

14A-166. Notes on Core Blowing Practice. W. Fearfield. *Foundry Trade Journal,* v. 87, Oct. 20, 1949, p. 497-498; discussion, 499-502.

Selection of equipment and procedures.

14A-167. Apparatus for Determination of Fluidity and Rate of Flow of Molten Metal. (In Russian.) L. L. Kunin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 870-872.

Apparatus, which permits simultaneous determination of the length of time necessary for filling the mold and rate of flow of the molten metal. Details of the process.

14A-168. Research on Castings. I. Cooling and Solidification of Sand Castings. (In Japanese.) Goro Ohira. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 40-44.

Investigated by determining temperature variations of the metal and the sand at various points throughout the assembly. Conclusions concerning heat transfer, cooling, and solidification mechanisms are summarized in English. An empirical formula for solidification time is introduced.

14A-169. Modern Practice in Investment Casting. Hiram Brown. *Foundry,* v. 77, Nov. 1949, p. 82-83, 205-210, 212.

Properties of pattern and investment materials. (To be continued.)

14A-170. The Thermal Properties and Chilling Power of Some Non-Metallic Mould Materials. R. W. Ruddle and A. L. Mincher. *Journal of the Institute of Metals,* v. 76, Sept. 1949, p. 43-90.

Brief mathematical treatment of the flow of heat in molds of low thermal conductivity. Experimental work was done to test the validity of the mathematical treatment, and determine the chilling powers of the materials examined. Cylinders were cast in molds of synthetic sand (green and dry), naturally bonded sand (green and dry), bonded magnesite, bonded silicon carbide, and plaster. Different alloys were used to examine the influence of solidification temperature on heat flow in the different molds. Approximate figures were derived for temperature diffusivity, apparent thermal conductivity, heat diffusivity, and "mold constant". These constants may be used to calculate solidification times of simple castings with fair accuracy. 29 ref.

14A-171. Dielectric Heating: Applications in the Foundry. J. Pound. *Metal Industry,* v. 75, Oct. 21, 1949, p. 351-353; Oct. 28, 1949, p. 379-381; Nov. 4, 1949, p. 399-400.

Fundamentals of dielectric heating; details of foundry processes involving its use; present and potential applications.

14A-172. New Casting Process Combines Features of Other Forming Methods. T. C. Du Mond. *Materials & Methods,* v. 30, Nov. 1949, p. 52-54.

Increased strength properties, improved finish, and less need for machining are some of the advantages claimed for the production of ferrous and nonferrous parts by the newly developed "Bacco" process. The molten metal is poured into a heated die. Constant pressure is exerted during solidification, followed by an increasing pressure to obtain a forging action. It can be used on aluminum, steel, brass, bronze, copper, etc.

14A-173. Pattern Jigging on Moulding Machines. H. Haynes. *Foundry Trade Journal,* v. 87, Nov. 3, 1949, p. 537-542.

Modern equipment and procedures.

14A-174. Single-Step Process Casts, Forges and Coins Most Metals. *Product Engineering,* v. 20, Dec. 1949, p. 147-148.

New process which casts, forges and coins complicated parts to finished dimensions having tolerances from 0.001 to 0.002 in. The number

of operations required after casting is reduced 60-70%; tensile and yield strengths of various metals—steel, aluminum, copper, bronze and brass are increased 10-40%.

14A-175. U. S. Navy Casting Research. H. H. Harris and Erle F. Ross. *Foundry,* v. 77, Nov. 1949, p. 80-81, 166, 168-170, 172; Dec. 1949, p. 86-91, 116, 118.

Experimental production of bladed and shrouded steam-turbine steels cast integrally and jet-engine rotors cast with and without inserted blades. Concluding (Dec.) installment: Specially designed facilities for production of centripetal or counterflow centrifugal castings for steam-turbine and jet-engine use.

14A-176. Pursuing the "Quality Ingredient". Harry B. Swan. *Foundry,* v. 77, Dec. 1949, p. 78, 209, 211.

Factors to be watched and controlled, based on long experience in the foundry industry.

14A-177. Production Aspects of Precision Casting. Alan Whittaker. *Machinery* (London), v. 75, Nov. 17, 1949, p. 709-711.

Advantages and limitations, defects, process layout, and control.

14A-178. Klei als bindmiddel in normzand. (Clay as a Molding-Sand Binder.) M. Stap. *Metalen,* v. 4, Oct. 1949, p. 27-32.

Strength properties of different types of molding sand with varying percentages of moisture contents and with clay as the binder.

14A-179. Algumas Consideraçoes Sobre o Controle de Areias de Fundiçao. (Some Considerations Concerning the Control of Foundry Sands.) Carlos Dias Brosch, Dino Ferraresi, and Heitor Corrêa Gonçalves. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 362-374.

The two most important factors in the control of foundry sand (moisture content and fines) were experimentally investigated. Influence of these factors on the quality of castings.

14A-180. Foundry Cupola Dust Collection. William N. Witheridge. *Heating and Ventilating,* v. 46, Dec. 1949, p. 69-74.

Methods for removal of dust from cupola stack gases and properties of emissions from the ferrous foundry cupola. 27 ref.

14A-181. Modern Practice in Investment Casting. Hiram Brown. *Foundry,* v. 77, Dec. 1949, p. 93, 241-248.

Preparation of investments, readying the mold, gating practice, and melting and pouring. (Second of three articles.)

14A-182. This Problem of Air Pollution. *American Foundryman,* v. 16, Dec. 1949, p. 22-24.

In connection with cupola-stack emission.

14A-183. First Principles of Gating: Progress Report on One of Nine Research Projects. *American Foundryman,* v. 16, Dec. 1949, p. 27-29.

Results of A.F.S. Research Project on fluid-metal flow confirm some techniques of gating and condemn others. Report to date refers only to gating practice applicable to castings having substantial lateral dimensions but relatively small vertical height.

14A-184. The Foundry Industry in Argentina. Macedonio Z. Lopez. *American Foundryman,* v. 16, Dec. 1949, p. 34-38.

14A-185. Modern Foundry Methods. *American Foundryman,* v. 16, Dec. 1949, p. 42-44.

Development of plaster-mold casting process for complicated cylindrical shapes on a production basis to tolerances within $\pm$ 0.005 in.

14A-186. Control Casting Distortion. Alfred E. Wells. *American Foundryman,* v. 16, Dec. 1949, p. 48-49.

Principles of casting distortion on the basis of a few basic shapes. Knowledge of these principles aids in prevention or minimization of distortion.

14A-187. A Study of the Principles of Gating. R. E. Swift, J. H. Jackson, and L. W. Eastwood. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 76-88.

Previously abstracted from preprint. See item 14A-55, 1949.

14A-188. Modern Foundry Core and Mold Ovens. Charles A. Barnett. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 181-201; discussion, p. 201-203.

Previously abstracted from preprint. See item 14A-54, 1949.

14A-189. Sand Properties vs. pH. Bradley H. Booth. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 210-220; discussion, p. 220-221.

Effect of successively larger additions of Na_2CO_3. It was found that pH value of a foundry sand does have an effect on sand properties.

14A-190. A Study of the Workable Green Strength of Core Mixtures. H. W. Dietert. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 386-391; discussion, p. 391.

Reports investigation undertaken to make test methods available which could be used to measure the ability of a core mixture in the green state to make a standing core,

to carry an over-hang section, to resist cracking on rolling-out or on handling, and to resist sagging on handling.

14A-191. Scabbing Tendencies of Molding Sands. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 400-407; discussion, p. 407-408.

Progress report which indicates that laboratory tests can be used to predict the above. Data on dry and hot compressive strength at 500° F. and on maximum strain value of green compression specimens show promise of correlation with scab defects.

14A-192. Casting Surface Finish. H. H. Fairfield and J. MacConachie. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 521-525; discussion, p. 525.

Previously abstracted from preprint. See item 14A-53, 1949.

14A-193. Plastic Binders for Foundry Sand Practice. H. K. Salzberg. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 357-365; discussion, p. 365-366.

Previously abstracted from preprint. See item 14A-52, 1949.

14A-194. Design and Operation of a 10-in. Diameter Cupola. D. E. Krause and H. W. Lownie, Jr. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 163-171; discussion, p. 171-172.

Previously abstracted from preprint. See item 14A-51, 1949.

14A-195. Causes of Rat-Tail Casting Defects. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 526-534.

Previously abstracted from preprint. See item 14A-50, 1949.

14A-196. Heat Transfer: A Foundryman's Tool. Victor Paschkis. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 310-314; discussion, p. 314.

Previously abstracted from *American Foundryman,* item 14A-101, 1949.

14A-197. Production and Consumption of Heat in the Cupola. D. W. Gunther. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 343-347; discussion, p. 347-353.

Previously abstracted from condensation in *Industrial Heating,* item 14A-102, 1949.

14A-198. Graphite Resistor Furnace Melting Practice. B. N. Ames and N. A. Kahn. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 157-161; discussion, p. 161-162.

Previously abstracted from preprint, item 16A-30, 1949.

14A-199. Risering Castings. J. B. Caine. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 66-75.

Previously abstracted from *American Foundryman,* item 14A-28, 1949.

14A-200. (Book) **Bibliography of Centrifugal Casting.** Howard F. Taylor and C. L. Register. 1949. American Foundrymen's Society, 222 W. Adams St., Chicago 6, Ill. $1.50.

Compares centrifugal casting with other casting methods and lists more than 300 articles, arranged by years of publication, and 500 patents. Contains a brief history of the development of centrifugal casting, a discussion of its fundamentals, and a list of 85 publications in which bibliographic references appear, together with names and locations of publishers and an author index.

14B—Ferrous

14B-1. Mechanization Triples Foundry Capacity. R. W. Anderson. *Foundry,* v. 77, Jan. 1949, p. 70-73.

Equipment and procedures of gray-iron foundry of National Sewing Machine Co.

14B-2. Research at American Steel Foundries. Edwin Bremer. *Foundry,* v. 77, Jan. 1949, p. 94-97, 174, 176, 178.

Research equipment and problems worked on. The firm does not engage in pure research, as such, but is concerned principally with development of improved products and improved foundry methods.

14B-3. Steel Castings for Aircraft. E. J. Brown and F. Rodgers. *Foundry Trade Journal,* v. 85, Nov. 18, 1948, p. 475-480; Nov. 25, 1948, p. 501-504; discussion, p. 505-507.

Problems involved in the production of complicated components. Experimental data. Effects of aluminum.

14B-4. Pattern and Core Equipment. *B.S.F.A. Bulletin,* v. 1, Jan. 1949, p. 1-7.

Use in manufacture of steel castings.

14B-5. Oxygen Enrichment of the Cupola Air Blast. *Pig Iron Rough Notes,* Autumn 1948, p. 13-15.

Use at Harrison-Corry Co., Knoxville, Tenn. The oxygen is not added continuously, but used intermittently whenever the temperature of the iron has been lowered due to various causes.

14B-6. Investigation on Dissolved Gases in Cast Iron. (Continued.) J. E. Hurst. *Pig Iron Rough Notes,* Autumn 1948, p. 27-30.

Influence of dissolved gases on soundness. Types of defects obtained with sands having different properties and moisture contents, and at different casting temperatures.

14B-7. Replacement Castings; Some Jobbing Foundry Methods. Tubal Cain. *Iron and Steel,* v. 21, Dec. 1948, p. 613.

Method for producing a combined flywheel and clutch race as a replacement for a broken part, without use of a pattern, in order to speed the job.

14B-8. Steel Die Castings Produced Successfully. Robert B. Stanton. *American Machinist,* v. 93, Jan. 13, 1949, p. 118-119.

Steel die castings are now produced commercially by a combination of tungsten-carbide lined injection cylinders, an induction furnace, and silicone die lubricants.

14B-9. Patterns and Molding Methods for Steel Castings. John Howe Hall. *Foundry,* v. 77, Jan. 1949, p. 76-79, 208, 210-213.

Molding with cement-bonded sand and handling of large cored work.

14B-10. Roll Founding: Some Physical and Metallurgical Factors. W. G. Scott. *Iron and Steel,* v. 22, Jan. 1949 p. 11-16.

Factors involved in casting of rolling-mill rolls and recommended procedures.

14B-11. Casting Stainless Steel Centrifugally in Permanent Metal Molds. Herbert J. Cooper. *Iron Age,* v. 163, Jan. 27, 1949, p. 56-59.

Techniques developed primarily as a means of meeting the rigid requirements of large rings used in the Nene jet engine. The process holds promise for many industrial applications such as pump liners, seat rings, and other cylindrical shapes.

14B-12. Iron Melting Costs in the Cupola and Electric Furnace. A. W. Gregg. *Foundry,* v. 77, Feb. 1949, p. 78-79, 244, 246.

Comparative cost analysis. Recommends use of the cupola if good coke is available; otherwise duplexing with cupola and electric furnace may be necessary.

14B-13. Old Foundry Acquires the New Look. Robert O. Mayer. *Foundry,* v. 77, Feb. 1949, p. 248, 250, 252, 254.

Equipment and procedures of Haven Malleable Castings Co., Cincinnati.

14B-14. Doba pobytu kovové vsazky v kuplovne. (Time Necessary for Melting the Cupola Charge.) Mikulas Czyzewski. *Hutnické Listy* (Metallurgical Topics), v. 3, Nov. 1948, p. 330-335.

Fundamental equations of the cupola process with special attention to the period required for heating and for melting. An equation for calculating the heat-transfer factor for gas to metal. Individual factors influencing melting.

14B-15. Ironfounding and the Metallurgy of Cast Iron. J. E. Hurst. *Metallurgia,* v. 39, Jan. 1949, p. 129-132.

Developments since World War I in cast-iron metallurgy, production methods, plant and equipment, and in foundry education, training, and research.

14B-16. Producing Nodular Graphite With Magnesium. C. K. Donoho. *American Foundryman,* v. 15, Feb. 1949, p. 30-37.

Results of more than 150 experimental heats, with several casts from each heat, using magnesium additions. Methods of adding the magnesium and results.

14B-17. Reclaim Ferrous Foundry Sand. E. C. Jeter. *American Foundryman,* v. 15, Feb. 1949, p. 40-44.

Roasting method used during the war by aluminum and magnesium foundries was unsatisfactory for ferrous foundry practice. Advantages and disadvantages of wet and dry methods.

14B-18. Steelmaking at a British Foundry. Norman F. Dufty. *Foundry,* v. 77, Feb. 1949, p. 72-73, 256, 258-262.

Procedures and equipment using two 5-ton electric-arc melting furnaces. (To be concluded.)

14B-19. Patterns and Molding Methods for Steel Castings. IV. John Howe Hall. *Foundry,* v. 77, Feb. 1949, p. 90-93, 210, 214, 216, 219-220. 222.

Use of all-core assemblies and molding practice with skeleton patterns. (To be concluded.)

14B-20. Roll Founding. W. G. Scott. *Foundry Trade Journal,* v. 86, Jan. 20, 1949, p. 47-53; Jan. 27, 1949, p. 77-79.

Details of procedure for casting large units.

14B-21. Stahlhohlguss als Vormaterial. (Hollow Steel Castings as Semi-Finished Products.) Karl Simoneit and Wilhelm Rädeker. *Stahl und Eisen,* v. 68, Nov. 4, 1948, p. 419-426.

The casting of ingots in stationary molds and the centrifugal casting of hollow ingots. Methods are critically evaluated and applications for centrifugally cast ingots are indicated.

14B-22. Elaboration d'une fonte mécanique facilement usinable. (Development of a Highly Machinable Cast

Iron for Machine Parts.) Gabriel Joly. *Fonderie*, Nov. 1948, p. 1389-1391.

Composition and method of production; mechanical properties.

14B-23. Cupola Operations Today. *Canadian Metals and Metallurgical Industries*, v. 12, Feb. 1949, p. 41. Based on address by J. Hughes.

Cupola refractories, operation, and charge calculation.

14B-24. Magnesium Treatment for Nodular Graphite Cast Iron. *Iron Age*, v. 163, Feb. 24, 1949, p. 97-99.

The processing of nodular graphite cast iron. Influence of various Mg containing additions on physical properties. Precautions to be observed in conducting the Mg treatment from the standpoint of safety and optimum properties.

14B-25. Malleable Iron Foundry Brought up to Date. *Foundry*, v. 77, Mar. 1949, p. 76-79, 198.

Modernized and mechanized foundry of National Malleable & Steel Castings Co., Indianapolis.

14B-26. Patterns and Molding Methods for Steel Castings. John Howe Hall. *Foundry*, v. 77, Mar. 1949, p. 92-97, 260-262.

Use of various types of sweeps to form the mold cavity. (5th and concluding article.)

14B-27. New Gray Iron Foundry Replaces 60-Year Old Unit. *Foundry*, v. 77, Mar. 1949, p. 244, 246, 248.

Modernized foundry of Huber Mfg. Co., manufacturer of road-building and maintenance equipment.

14B-28. Steel Foundry Research. Tom Bishop and K. G. Lewis. *Foundry Trade Journal*, v. 86, Feb. 10, 1949, p. 111-117.

Work being conducted at Sheffield University in England includes improved fluidity-test procedure and equipment; micrographic study of the sand-metal interfaces; apparatus for determination of hot-tearing susceptibility; study of various molding sands and bonding agents; treatment and inspection of castings; and other phases.

14B-29. More Curious Wasters; Their Cause and Cure. *Iron and Steel*, v. 22, Feb. 1949, p. 38.

Unusual defective castings occasionally encountered in the foundry. Examples of scrapped ferrous castings which necessitated considerable investigation before the reason for failure was established.

14B-30. German Foundry Practice; Interrogation of Dr. Lanzendorfer. *Iron and Steel*, v. 22, Feb. 1949, p. 53-54. Based on BIOS Final Report No. 1802.

The practice described is that followed at Deutsche Einsenwerke, Mulheim, for ferrous metals.

14B-31. Shrinkage Cavities; Their Elimination by the Quasi-Bessemerizing Process. W. S. Williams. *Iron and Steel*, v. 22, Feb. 1949, p. 55.

Patented British process. Cavities can be practically eliminated by reducing the size of the feeder-head necks from 10 in. to 3 in. for even very heavy castings. Feeding of hot metal is automatic, it being kept fluid by combustion of a small quantity of silicon and carbon. The main object of the process is the refining of the iron in the body of the casting, and particularly in the vicinity of the blowing head.

14B-32. Automatische luchtgewichtregeling voor koepelovens. (Automatic Blast Control in the Cupola.) C. G. Dalhuysen. *Metalen*, v. 3, Jan. 1949, p. 107-110.

A newly developed method. Theoretical bases and structural details of the apparatus.

14B-33. Neue Erkenntnisse im Kupolöfenschmelzbetrieb. (New Facts on Melting in the Cupola Furnace.) August Kentischer. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Sept. 1948, p. 75-80.

In the cupola furnace the iron is carburized almost exclusively above the combustion zone. The hearth, and the zones of combustion, reduction, melting, superheating, and carburization, and their respective effects on the melt.

14B-34. Eine Studie uber die Formmethoden zur Herstellung fehlerfreier Gussstucke. (A Study on Molding Practice for the Production of Flawless Castings.) C. Englisch. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Sept. 1948, p. 83-85.

Recommended procedures.

14B-35. Das Schleudern von Stahlguss. (The Centrifuging of Cast Steel.) Georg Viktor Schmidt. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 101-104.

Problems involved in the above using steel molds. A centrifuge and its parts are described. A successful method of centrifugal casting and of cleaning the finished castings.

14B-36. Die Herstellung von niedriggekohltem Temperguss im Konverter. (The Production of Low-Carbon Malleable Iron in the Converter.) Hermann Triebeler. *Die Neue Giesserei*, v. 33-35 (new ser., v. 1), Oct. 1948, p. 122-123.

14B-37. Sollen wir in Zementsand formen? (Should We Mold With "Cement Sand"?) Helmut Grolman. *Die*

Neue Giesserei, v. 33-35 (new ser., v. 1), Oct. 1948, p. 123-124.

Proposes molds of cement sand (quartz sand, cement, and water in the ratio 85:10:5-6) for mass production of high-quality castings.

14B-38. Lunkerbildung und Erstarrungsvorgänge im Stahlguss. (Piping and Solidification Reactions in Steel Casting.) Hubert Juretzek. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Nov. 1948, p. 139-146.

The problem of pipe formation and its prevention. 30 ref.

14B-39. Warmrissbildung in Stahlguss. (Hot Crack Formation in Steel Castings.) Hubert Juretzek. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Dec. 1948, p. 172-174.

Effect of mold material and condition as well as the critical temperature range in which cracking occurs. Specific recommendations. 10 ref.

14B-40. "Electrocasting" Steel. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 98-101.

Procedures and equipment in manufacture of miscellaneous steel castings, using a 3000-lb. electric furnace.

14B-41. High-Strength Cast Irons. Tracy C. Jarrett. *Foundry,* v. 77, Apr. 1949, p. 66-73, 228, 230.

Mode of occurrence and distribution of excess carbon in cast iron, and ways in which it may be modified. The different structures obtainable with different treatments and different alloy additions. Discussion of heat treatment. Development of centrifugal casting method for piston rings.

14B-42. Describes Development of Ductile Cast Iron. *Foundry,* v. 77, Apr. 1949, p. 111, 114, 116.

Summarizes recent talks by Don J. Reese and Albert P. Gagnebin on new material developed by International Nickel Co. Potential applications.

14B-43. Casting Large Wheels and Drums. Pat Dwyer. *Foundry,* v. 77, Apr. 1949, p. 172-173, 175, 178-179.

Procedure for large wheels having gray-iron rims and hubs and wrought-iron spokes.

14B-44. Areias de fundicao para aco. (Molding Sand for Steel.) Carlos Dias Brosch and Rodolfo Mottin. *Boletim da Associacao Brasileira de Metais,* v. 4, Oct. 1948, p. 451-462; discussion, p. 463-464.

Addition of an oxidation agent (MnO_2) eliminates the possibility of impregnating the inside mold surface by the flux, thus resulting in much higher quality of steel castings.

14B-45. Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes. J. F. Wallace and J. L. Martin. *American Foundrymen's Society,* Preprint No. 3, 1949, 6 pages.

Mechanism of formation and means of prevention of hot tears in centrifugally cast tubes. Mathematical expressions for variables involved.

14B-46. A Study of Insulating and Mildly Exothermic Antipiping Compounds Used for Steel Castings. S. L. Gertsman. *American Foundrymen's Society,* Preprint No. 19, 1949, 9 pages.

A standard casting was designed and a series of tests made. Information was obtained on thermal characteristics produced in the riser metal, the minimum size of riser that can be used for the standard casting with each compound, the type of shrinkage cavity produced in the riser, and the length of time required for the top of the head to freeze. Method can be used as a standard to evaluate the efficiency of new compounds.

14B-47. Beitrag zur Auswahl und Verwendung von Form und Kernschwärzen fur NE-Guss. (Selection and Use of Mold and Core Blacks for NE Castings.) Edmund R. Thews. *Die Neue Giesserei,* v. 36, (new ser., v. 2), Feb. 1949, p. 47-49.

A study of different carbon blacks and their effect on the gas permeability of sand molds and on the general qualities of castings. Compares the gas permeability of sand molds with and without carbon blacks.

14B-48. Blackheart Malleable Cast Iron; Its Production and Properties. *Metallurgia,* v. 39, Mar. 1949, p. 247-252.

Methods and equipment of a British plant. Properties and applications.

14B-49. A Decade of Progress in British Ironfounding. W. W. Braidwood. *Foundry Trade Journal,* v. 86, Mar. 24, 1949, p. 253-260; Mar. 31, 1949, p. 283-288.

New developments in equipment and procedures. 40 ref.

14B-50. Control of Cupola Stack Emissions. John F. Drake, Theodore G. Kennard, and W. A. Saylor. *Iron Age,* v. 163, Apr. 7, 1949, p. 88-92.

A closed charging bell, dry-dust collector, and wet washer, which results in stack emissions within the limits set by the Los Angeles County air-pollution-control authorities. Nature of the material collected.

14B-51. Growth and Scaling Characteristics of High-Silicon Cast Iron. W. H. White and A. R. Elsea. *American Foundrymen's Society,* Preprint 25, 1949, 15 pages.

Theories of the growth mechanism. Experimental work to develop a superior growth-resistant cast iron for casting in the average gray-iron foundry, to demonstrate the advantages to be gained from use of high-Si cast iron for applications requiring growth resistance, and to increase ductility of the inherently brittle high-Si cast iron by use of small alloy additions. Results of various growth, scaling, and mechanical tests on specimens of high-Si and ordinary cast iron, both alloyed and unalloyed. 38 ref.

14B-52. Modern Foundry Methods. *American Foundryman,* v. 15, Apr. 1949, p. 122-125.

Production of miscellaneous gray-iron castings.

14B-53. Quality Control in the Foundry. Roscoe C. Byers and Joseph Dickman. *Foundry,* v. 77, May 1949, p. 102-105, 272, 274.

Quantitative information can be treated statistically to predict chemistry variation, dimensional variations, and machinability of castings.

14B-54. Core Dipping and Spinning. Arthur H. Allen. *Foundry,* v. 77, May 1949, p. 108-111.

Changes in equipment and practices made to improve block castings for Ford V-8 power plants. Schematic diagram showing elevation details of the automatic dipping and spinning conveyor and subfloor tank.

14B-55. Core Sand Practice in the Malleable Iron Foundry. Eric Welander. *Foundry,* v. 77, May 1949, p. 120-122, 262, 264.

Principal requirements of cores. Basic fundamentals of incorporating these properties into suitable cores at a reasonable cost.

14B-56. Roll Founding—Some Physical and Metallurgical Factors. W. G. Scott. *Blast Furnace and Steel Plant,* v. 37, Apr. 1949, p. 447-451, 476.

Previously abstracted from *Iron and Steel,* item 14B-10, 1949. (To be continued.)

14B-57. Construction of Cast Iron Equipment. J. Nixon Bewsher. *Industrial Chemist and Chemical Manufacturer,* v. 25, Apr. 1949, p. 219-221, 224.

General applications of cast iron in chemical-engineering equipment; foundry methods and design principles are considered. (To be continued.)

14B-58. Rolling Mill Components: Steel Castings in the Design of Large Units Subjected to Heavy-Duty Conditions. *Iron and Steel,* v. 22, May 1949, p. 151-153, 176.

Castings and their manufacture.

14B-59. Modern Foundry Methods. *American Foundryman,* v. 15, May 1949, p. 74-76.

Methods for mass production of high-alloy-steel cylinders for jet-engine turbine rings by centrifugal casting process in permanent molds.

14B-60. Roll Founding—Some Physical and Metallurgical Factors. Part II. (Concluded.) W. G. Scott. *Blast Furnace and Steel Plant,* v. 37, May 1949, p. 550-552. Reprinted from Iron and Steel.

Effects of temperature, slag composition, and heat treatment.

14B-61. Centrifugally Casting Hollow Steel Ingots. *Iron Age,* v. 163, May 26, 1949, p. 81. Based on article in *Iron and Coal Trades Review,* Apr. 15, 1949, discussing a paper presented at the Sept. 1948 meeting of the German Iron and Steel Institute.

Centrifugal casting is said to be the most satisfactory method. Also describes other methods.

14B-62. Castings for Presses Cover Wide Range of Sizes. Edwin Bremer. *Foundry,* v. 77, June 1949, p. 92-95, 248-249.

Procedures, layout, and equipment for a wide variety of gray-iron castings for an extensive line of presses.

14B-63. Economies of Castings and Weldings. E. C. Moore. *Welding,* v. 17, May 1949, p. 196-200.

As applied to large machine frames.

14B-64. Construction of Cast Iron Equipment. II. J. Nixon Bewsher. *Industrial Chemist and Chemical Manufacturer,* v. 25, May 1949, p. 262-264.

Foundry difficulties caused by unsatisfactory designs, and appropriate remedies.

14B-65. Loam Moulding of an Evaporator-Body Casting. W. H. Hornby. *Foundry Trade Journal,* v. 86, May 12, 1949, p. 433-438, May 19, 1949, p. 461-463.

Method used for a large and complicated casting.

14B-66. Formtechniken und Formverfahren unter besonderer Berucksichtigung der Zementsandformerei. (Techniques and Methods of Molding With Special Emphasis on Molding With Cement Sand.) Karl Ingendahl. *Die Neue Giesserei,* v. 36, (new ser., v. 2), Mar. 1949, p. 74-78.

As applied to heavy ferrous castings.

14B-67. Estudo do dimensionamento dos canais de alimentacao das pecas fundidas. (Study of the Dimensions of Feeder Channels for Molds.) Carlos Dias Brosch and Octavio Longo. *Boletim da Associacao Brasileira de Metais,* v. 5, Jan. 1949, p. 41-56.

A method for calculation of optimum dimensions for casting of iron.

14B-68. Modern Foundry Methods. *American Foundryman,* v. 15, June 1949, p. 40-42. Based on paper by Harold G. Sieggreen.

Procedures in designing pattern equipment for use in a high-production malleable foundry. All patterns, core boxes, and driers are drawn up in full detail. Each part is studied with respect to placement of the parting line, position of gates, most practical type of pattern equipment to use, and whether any casting design changes should be requested. Yield, scrap, gate removal, number of cores needed, amount of finish stock and draft required, and whether a straightening die will be needed.

14B-69. Convert Ladle Dimensions to Iron Weight. H. L. Campbell. *American Foundryman,* v. 15, June 1949, p. 48-49.

Determining capacities of iron-foundry ladles.

14B-70. Das Zementsandform- und kernverfahren-Einfuhrung in seine Theorie und Beispiele fur seine praktische Anwendung. (The Cement-Sand Mold and Core Process—Introduction Into Its Theory and Examples of Its Practical Application.) Martin Beilhack. *Die Neue Giesserei,* v. 36 (new ser., v. 2), May 1949, p. 138-142.

Method and its applications.

14B-71. Production of Medium and Heavy Iron Castings. G. W. Nicholls. *Foundry Trade Journal,* v. 86, May 26, 1949, p. 493-499; June 2, 1949, p. 525-528; June 9, 1949, p. 549-550; discussion, p. 550-552.

Various factors involved, including design, pattern construction, contraction and shrinkage, metal composition, runners and risers, cores, casting procedures, and raw materials. Step-by-step procedure.

14B-72. Reducing Atmosphere Pollution From Cupola Operation. *Industrial Heating,* v. 16, June 1949, p. 1010. Condensed from paper by John F. Drake and T. G. Kennard.

See abstract from *Iron Age,* item 14B-50, 1949.

14B-73. Machine Molding of Steel Castings. John Howe Hall. *Foundry,* v. 77, July 1949, p. 78-81, 186, 188-191.

First of four articles describing methods and equipment.

14B-74. Electrolytic Manganese in Acid Electric Steel Foundry Practice; Tests at National Malleable & Steel Castings Co., Sharon, Pa. *U. S. Bureau of Mines,* Report of Investigations 4482, June 1949, 23 pages.

Effect of electrolytic manganese on medium-manganese steel castings. In no case were the castings unsatisfactory, and the additional advantages of using manganese in pure form were apparent. Although the castings retained slightly more hydrogen than those made with ferromanganese, the hydrogen content was still within the permissible range and produced no deleterious effects.

14B-75. Untersuchungen uber die Primärkristallisation von unlegierten und legierten Stählen. (Research on the Primary Crystallization of Unalloyed and Alloyed Steels.) Hanns Wentrup and Hans Schrader. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 165-178.

Effect of inclusions on primary crystallization taking into consideration the effects of aluminum deoxidation, the formation of nitride, primary sulfide precipitation, melting and pouring temperatures, condition and temperature of the molds, evolution of gases, and salt additions. 15 ref.

14B-76. Hot Tears in Cast Steel Tubes. *Industrial Heating,* v. 16, July 1949, p. 1186. Condensed from "Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes", J. F. Wallace and J. L. Martin, *American Foundrymen's Society,* Preprint No. 3, 1949.

Previously abstracted from original, item 14B-45, 1949.

14B-77. Blast Humidity as a Factor in Cupola Operation. *Industrial Heating,* v. 16, July 1949, p. 1196, 1198. Condensed from paper by D. E. Krause and H. W. Lownie, Jr.

Results of experimental study of the effects of moisture content of the blast upon operation of the cupola and properties of the iron produced.

14B-78. Design and Operation of a 10 in. Diameter Cupola. *Industrial Heating,* v. 16, July 1949, p. 1200, 1202. Condensed from paper by D. E. Krause and H. W. Lownie, Jr., *American Foundrymen's Society,* Preprint 12, 1949.

Previously abstracted from original, item 14A-51, 1949.

14B-79. Symposium: Nodular Graphite Cast Iron. *American Foundryman,*

v. 16, July 1949, p. 32-41.

Separate communications (without titles) by D. J. Reese, C. K. Donoho, Gosta Vennerholm, and R. G. McElwee. Reese describes properties, production, and fabrication of ductile cast iron; comparative stress-strain curves of plain gray iron and ductile cast iron; influence of section thickness on mechanical properties of a cupola iron; influence of P, C, and Si on mechanical properties; also several photomicrographs. Donoho elaborates and modifies some points discussed in his paper "Producing Nodular Graphite With Magnesium" (Feb. issue). Vennerholm reviews progress of the past few years and results obtained by Ford Motor Co. Structures of several irons treated with a 50-50 Mg-Cu alloy. McElwee remarks concerning the present status of nodular iron.

14B-80. Modern Foundry Methods. *American Foundryman,* v. 16, July 1949, p. 42-43. From "Steel Castings in Welded Assemblies," John Howe Hall, to be published in *Transactions of the American Foundrymen's Society*, v. 57, 1949.

Various phases of the thermit-welding process of producing large steel castings for ships' structures.

14B-81. Present-Day Trends in Runner Practice. J. F. Measures. *Foundry Trade Journal,* v. 87, July 14, 1949, p. 57.

Runners used on medium-weight, machine-molded gray-iron castings. Their purpose is to fill the mold at predetermined speed and in such a manner that impurities cannot enter. Recent multi-ingate or distributed types of runner and a spring-loaded downright or runner basin for machine molding.

14B-82. Insulation of Risers for Ferrous Castings. James R. Power. *Foundry,* v. 77, Aug. 1949, p. 68-71, 230-231.

Experiments conducted with an inexpensive method of insulating risers to obtain a higher yield. A mixture of 40% sawdust, 26% dextrin and 34% water is pressed into the desired shapes, dried, coated with a refractory wash, and molded in position upon a pattern to form a riser cavity. When insulated risers are employed, the risers can be reduced in volume by at least 50%. Some disadvantages of the method.

14B-83. A Metallurgist Looks at Steel Foundry Operations. Everett R. Turner. *Foundry,* v. 77, Aug. 1949, p. 79, 222-229.

Importance of the cost factor and miscellaneous suggestions for furnace design, refractories, and operating procedures.

14B-84. Machine Molding of Steel Castings. John Howe Hall. *Foundry,* v. 77, Aug. 1949, p. 82-85, 175-176, 178, 180-181.

Second of four articles.

14B-85. Progressive Foundry Mechanization. Walter Rudolph. *Foundry,* v. 77, Aug. 1949, p. 196, 198.

At a comparatively small foundry for the production of heavy gray-iron castings.

14B-86. Variables in Producing Nodular Graphite Cast Iron by Magnesium Treatment. G. E. Holdeman and J. C. H. Stearns. *American Foundryman.* v. 16, Aug. 1949, p. 36-41.

The use of flux mixtures with the Mg alloys is said to have interesting possibilities.

14B-87. Oxygen Injection Process in Melting Low Carbon Cr-Ni Stainless Steel. H. J. Cooper. *American Foundryman,* v. 16, Aug. 1949, p. 44-46.

Effects of initial bath temperature, initial C and Cr contents, and volume of O_2 injected were studied. The use of oxygen in arc melting does not render the induction furnace obsolete for the melting of low-carbon 18-8. The oxygen-arc process reclaims low-quality 18-8 scrap of unknown carbon content while the induction melting process subsequently remelts the reclaimed heads and gates with close control of analysis.

14B-88. Gating Controls Temperature Gradients in Steel Casting. J. A. Sjuffstall. *American Foundryman,* v. 16, Aug. 1949, p. 52-53.

Improved gating technique for 45,000-lb. steel castings (cylinders for hydraulic presses).

14B-89. An Unusual Steel Casting. *British Steelmaker,* v. 15, Aug. 1949, p. 377-379.

Exacting technique employed to overcome production problems in the single-piece casting of a trolley frame for a 10-ton floor charger.

14B-90. Grinding Balls. E. F. Farren. *Foundry Trade Journal,* v. 87, Aug. 4, 1949, p. 155-157.

Mass production by centrifugal casting.

14B-91. Ship's Castings; Modern Methods and Equipment for the Production of Large Units. *Iron and Steel,* v. 22, Aug. 1949, p. 383-384.

14B-92. The Mechanism of Freezing of Horizontal Steel Castings. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 437-450.

A detailed metallurgical study of 15 experimental carbon steel castings made to ascertain the influence of casting temperature upon the mechanism of solidification and, therefore, upon the structure and physical properties of steel castings.

14B-93. Pots à recuire la fonte malléable. (Pots for Remelting of Cast Iron.) Gabriel Joly. *Fonderie,* May 1949, p. 1591-1592.

Use of stainless steel or white cast iron to increase pot life. Chemical composition and comparative costs. Methods for improvement of the durability of pots in general.

14B-94. Ueber das Verhalten von Formsanden beim Abgiessen von Stahl. (The Behavior of Molding Sands in the Casting of Steel.) Hans Zeuner and Karl Roesch. *Die Neue Giesserei,* v. 36 (new ser., v. 2), July 1949, p. 195-199.

The sudden change in the size of the quartz grains when heated by the molten steel as well as the sudden formation of vapor and gases at the outer layer of the sand mold are important factors in the formation of scab. Phenomena at the surface of the sand when the steel is cast were studied by expansion and gas-pressure measurements.

14B-95. Effect of Stripping Temperature on the Properties of Pearlitic Grey Cast Iron. *Foundry Trade Journal,* v. 87, Aug. 18, 1949, p. 201-209; Aug. 25, 1949, p. 237-241; discussion, p. 241-245.

Committee report. Trend toward rapid removal of castings from the molds, while still at high temperatures. Considers only castings stripped as a whole and cooled to room temperature in still air. No attention was given to effects of accelerated cooling after stripping, nor to the stripping of only certain parts of a casting in order to reduce distortion or cracking. Mechanical properties of bars and other shapes of alloyed and unalloyed iron, and effects of stripping temperature on distortion.

14B-96. New Memphis Foundry Sets Standard in Good Working Conditions. William G. Gude. *Foundry,* v. 77, Sept. 1949, p. 66-71, 152, 155.

Procedures and equipment of new gray-iron foundry of International Harvester Co.

14B-97. Casting a Long Roll Grinder Bed. Pat Dwyer. *Foundry,* v. 77, Sept. 1949, p. 86-88, 220.

Several interesting features in advanced foundry practice. Weight is 58,020 lb. and length 42 ft., 9 in.

14B-98. Core Making and Mould Closing. *BSFA Bulletin,* v. 1, July 1949, p. 1-7.

In the steel foundry.

14B-99. Pouring Brake Shoes in India. J. S. Gupta. *American Foundryman,* v. 16, Sept. 1949, p. 38-39.

Set of flasks whereby light castings can be made in large numbers without the necessity of using molding boxes.

14B-100. Advanced Casting Methods Expected to Result in More Economical Foundry Practice and Better Castings. *Steel,* v. 125, Oct. 3, 1949, p. 68-71, 97-98, 100, 102.

Improvements in centrifugal and centripetal casting processes have been evolved in an intensive Navy research program for developing satisfactory methods for producing shrouded steam turbine wheels cast integrally and jet engine rotors cast with and without inserted blades.

14B-101. Hitting the Bull's-Eye With Precision Castings. William A. Patzer. *Metal Progress,* v. 56, Oct. 1949, p. 520-521.

Investment casting of steel parts for the "Rifle Sport" unit solved problems encountered by the A. B. T. Manufacturing Corp.

14B-102. Sand in the Mill vs. Sand in the Mold. J. B. Caine. *Foundry,* v. 77, Oct. 1949, p. 68-70, 232-240.

Effects of variables in molding sand use, which include moisture evaporation during sand handling, ramming, evaporation after ramming, mold finishing, and washing. Studies were made using standard AFS specimens, 2 in. diameter by 2 in. long, with molten steel.

14B-103. Machine Molding of Steel Castings. (Concluded.) John Howe Hall. *Foundry,* v. 77, Sept. 1949, p. 76-77, 166, 168, 170, 172, 175, 178-179; Oct. 1949, p. 90-91, 174, 176, 179-180.

Use of roll-over and jolt-squeeze molding machines in the steel foundry, as well as use of the sand-slinger and core blowers in production of molds and cores.

14B-104. Centrifugal Casting of Cylinder Sleeves and Piston Ring Pots. *Automotive Industries,* v. 101, Oct. 1, 1949, p. 40, 58, 68.

Fabrication from iron by Centrifugal Foundry Co. Parts are shipped in the form of rough-machined castings to various manufacturers. Operations include casting, heat treating, and machining.

14B-105. Can the Carbon Content of Cast Iron Melts Be Raised? J. G. Pearce. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 33-35.

Various possibilities for raising

carbon and reducing the sulfur content. The most spectacular and possibly the most expensive way is to use a basic lining in the cupola. It is concluded, however, that little can be done at present.

14B-106. Spheroidal-graphite Cast Iron. Disclosure of Production Details. W. W. Braidwood and A. D. Busby. *Foundry Trade Journal,* v. 87, Sept. 15, 1949, p. 327-334.

British experience in the treatment of gray cast iron by the introduction of magnesium, to produce castings containing graphite in spheroidal form. Production details, properties, structure, effects of annealing applications.

14B-107. Contraction and Distortion in Gray Iron Castings. E. Longden. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 36-56; discussion, p. 56.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-10. See item 14b-56, 1948.

14B-108. Causes of Rat-Tail Casting Defect. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 116-136; discussion, p. 136-137.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-15. See item 14b-57, 1948.

14B-109. Oxygen-Enriched Cupola Blasts. W. C. Wick. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 246-256; discussion, p. 256-259.

See abstract from *American Foundryman,* item 14b-70, 1948.

14B-110. Solidification Characteristics of Gray Cast Iron. J. E. Fifield and J. H. Schaum. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 382-388; discussion, p. 388.

Solidification studies were conducted by bleeding partially solidified gray iron castings and by obtaining cooling curves at various points within castings which were identical to the bled castings and which were poured simultaneously but allowed to solidify completely. Cooling curves and test specimens.

14B-111. Gating Systems for Metal Castings. W. H. Johnson and W. O. Baker. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 389-397.

Previously abstracted from *Foundry.* See item 14b-102, 1948.

14B-112. Observations on Knock-Off Risers as Applied to Steel Castings. S. W. Brinson and Joseph A. Duma. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 586-597; discussion, p. 597-601.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-9. See item 14b-55, 1948.

14B-113. Applications of Correlation in the Malleable Iron Foundry. Robert G. Seidel. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 563-566; discussion, p. 566.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-22. See item 14b-60, 1948.

14B-114. Steel Castings for Aircraft. E. J. Brown and F. Rodgers. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A95-A104; discussion, p. A104-A106.

Previously abstracted from *Foundry Trade Journal.* See item 14B-3, 1949.

14B-115. The Cleaning of Steel Castings. A. B. Lloyd. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A107-A119; discussion, p. A119-A122.

Previously abstracted from *Foundry Trade Journal.* See item 14b-109, 1948.

14B-116. Problems of Contraction and Distortion in Cast-Iron Castings. E. Longden. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A152-A163; discussion, p. A163-A165.

Previously abstracted from *American Foundrymen's Association,* Preprint No. 48-10. See item 14b-56, 1948.

14B-117. British Bathmaking Practice. A. Young. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A173-A177; discussion, p. A177-A178.

Production of porcelain-enameled cast-iron bathtubs. Includes information on metal composition and enameling practice.

14B-118. The Manufacture of Some Large Castings for Marine Engineering. D. H. Young. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B8-B17.

14B-119. Practical Aspects of Machine Moulding. J. H. Peers. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B18-B21.

A general discussion.

14B-120. The Loam Moulding of Rope-Barrel Castings. D. Robertson. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B45-B52; discussion, p. B52-B53.

Procedures for casting of cable drums, each weighing about 25,000 lb., for 150-ton floating cranes.

14B-121. Precision Investment Casting and Its Future. D. F. B. Tedds. *Proceedings of the Institute of British*

Foundrymen, v. 41, 1947-1948, p. B59-B66.
The process; future prospects.

14B-122. The Constant-Charge System of Cupola Operation. W. W. Braidwood. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B67-B74.
Previously abstracted from *Foundry Trade Journal.* See item 14b-79, 1948.

14B-123. Patching the Cupola. N. J. Dunbeck and T. E. Barlow. *American Foundryman,* v. 16, Oct. 1949, p. 48-57.
Development of compressed-air-gun placement process and test results on a number of combinations of ganisters and clays for workability, density, shrinkage, slag resistance, slump resistance, apparent porosity, and temperature effects.

14B-124. Die Fehler im Gussblock und ihre Beziehungen zur Giesstemperatur und Giessgeschwindigkeit. (Defects in Cast Ingots and Their Relation to Temperature and Rate of Casting.) Fritz Beitter. *Stahl und Eisen,* v. 69, Aug. 18, 1949, p. 585-599; discussion, p. 599-600.
Refers only to ferrous ingots. 56 ref.

14B-125. Standards Must Be Observed in Cupola Operations. R. H. Olmsted. *Foundry,* v. 77, Nov. 1949, p. 78-79, 200, 203-204.
Recommended procedures developed as a result of an investigation conducted to determine the causes of habitual excessive burn-out of linings in certain areas of a large cupola.

14B-126. Develops New Type Unit for Desulphurizing Cupola Iron. Frank E. Bates. *Foundry,* v. 77, Nov. 1949, p. 88-91.
Equipment designed to simplify and make more effective the economical addition of soda ash to cupola iron. The process is intended not only to promote intimate contact between the molten metal and desulfurizing agent, but also to assist in slag separation.

14B-127. The British Team Reports on U. S. Steel Foundries. *Foundry,* v. 77, Nov. 1949, p. 92, 172, 174, 176, 178.
Excerpts from report of British Steel Founders' Productivity Team of 16 men who spent five weeks visiting steel foundries in the U. S.

14B-128. Steel Castings; A Review of Factors Affecting Surface Finish. P. R. Beeley. *Iron and Steel,* v. 22, Oct. 1949, p. 451-454.
Reactions with mold materials; metal penetration; effects of mold and core compositions, grain size, etc.; effects of mold coatings; other factors. 13 ref.

14B-129. Nodular Graphite; Producing Spheroidal Structures With Magnesium. C. K. Donoho. *Iron and Steel,* v. 22, Oct. 1949, p. 455-458.
See abstract from *American Foundryman,* item 14B-16, 1949.

14B-130. Gates and Risers; Removal by Abrasive Cut-off and by Band Saws. H. J. Chamberland. *Iron and Steel,* v. 22, Oct. 1949, p. 459-460.
Advantages and disadvantages of the two procedures. Comparative times for a series of typical stainless steel parts. The friction saw is faster in most cases.

14B-131. Light Castings for Vitreous Enamelling. H. McNair. *Foundry Trade Journal,* v. 87, Oct. 6, 1949, p. 433-439, 442.
Refers to iron castings of 1-50 lb. weight and thicknesses of ⅛-¼ in. Effect of metal composition, of cupola practice, of melting flux, and of molding sand. Worm marks or rat-tail defects, feeding systems, patterns and their care, design, rate of cooling, warping, and "boiling" during enameling.

14B-132. Sistema di formatura e di colata per una serie di grossi volani in ghisa. (Molding and Casting System for a Series of Large Cast-Iron Flywheels.) Fulvio Forti. *La Metallurgia Italiana,* v. 41, Mar.-Apr. 1949, p. 57-62.
Casting a series of wheels of 3 tons average weight. The standard system resulted in serious defects, so a modified pouring system was developed, which gave good results.

14B-133. Cenni sulla fabbricazione della ghisa sintetica al forno elettrico. (Notes on the Melting of Synthetic Cast Iron in the Electric Furnace.) Ermeneglido Zan. *La Metallurgia Italiana,* v. 41, May-June 1949, p. 144-148.
Melting of steel scrap carburized with coke and with scrap graphite electrodes. Efficiency obtained during the various carburizing periods and properties of the cast iron so obtained.

14B-134. Betriebserfahrungen mit einer Heisswind-Kupolofenanlage. (Plant Experiences With a Hot-Blast Cupola Furnace.) Otto Mattern. *Die neue Giesserei,* v. 36 (new ser., v. 2), Sept. 1949, p. 275-280.
Superiority of the hot-blast over the cold-blast cupola from the standpoint of economy and quality of melt.

14B-135. Centrifugal and Vacuum Investment Casting. E. F. Ross. *Steel,* v. 125, Nov. 7, 1949, p. 116-117, 144.
Used to produce intricate, close-tolerance parts from difficult-to-cast

alloys. Plastic patterns, filling molds, and vacuum casting.

14B-136. Spheroidal-Graphite Cast Iron. W. W. Braidwood and A. D. Busby. *Nickel Bulletin,* v. 22, Aug.-Sept. 1949, p. 126-130.

Previously abstracted from *Foundry Trade Journal.* See item 14B-106, 1949.

14B-137. What's in a Name? *American Foundryman,* v. 16, Oct. 1949, p. 34-38; Nov. 1949, p. 44-46.

Proper terminology for the new type of iron known variously as nodular, spheroidal, globular, lump, etc. Contributors to opinion survey are J. E. Rehder, Gosta Vennerholm, Albert De Sy, A. P. Gagnebin, Charles K. Donoho, E. K. Smith, and Wm. W. Austin, Jr. (Oct. issue); and H. Morrogh, D. E. Krause, W. W. Levi, and J. C. H. Stearns (Nov. issue).

14B-138. Foundry Steel-Melting Conference; Discussion on Steelmaking Processes. *Metallurgia,* v. 40, Oct. 1949, p. 313-318.

Proceedings of conference held by the Steel Castings Div. of BISRA. Converter and furnace design, control of sulfur and phosphorus, oxygen enrichment, and refractories.

14B-139. Colloidal Phenomena in Metals. XII. Explanation of the Phenomenon of Crust Formation During Casting of Metals on the Basis of the Electrochemical Theory of Slags. (In Russian.) Yu. A. Klyachko and L. L. Kunin. *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 22, July 1949, p. 707-715.

Laboratory investigation. Casting of iron in a sand mold is followed by formation of an intermediate phase, which represents the product of reaction of metal oxides with oxides of the mold mixture. On the basis of the ionic theory of slags and chemical analysis of experimental slags, molecular weight of the reaction product was determined and confirmed by X-ray investigation. 15 ref.

14B-140. Quality Control Review: Test Procedures for Quality Control of Gray Iron Castings. F. J. Walls. *American Foundryman,* v. 16, Nov. 1949, p. 51-59.

Tests on sands, core binders, etc., metallurgical control; gating systems; testing and sampling of coke; blast-air moisture content and pressure; charging practice; controlling and estimating carbon content; chill control; pouring practice; casting treatment and shakeout; destructive and nondestructive testing. 10 ref.

14B-141. Flow-Line Foundry. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Nov. 1949, p. 78-81, 98-99.

Equipment and procedures in manufacture of light and heavy steel castings.

14B-142. German Foundries; Plants and Practice During the War. *Iron and Steel,* v. 22, Nov. 1949, p. 487-490. Condensed from Sec. IV, BIOS Overall Report No. 15, "The Ferrous Metal Industry in Germany During the Period 1939-1945", by Geo. Patchin and E. Brewin.

Melting plant and practice, materials and equipment for molding and coremaking, foundry methods, production of iron and steel castings, and foundry mechanization.

14B-143. Southern Foundry Is Designed for Mass Production. *Foundry,* v. 77, Dec. 1949, p. 68-71, 249-251.

Procedures and equipment of gray-iron foundry.

14B-144. Segregation in Small Steel Castings. Harold F. Bishop. *Foundry,* v. 77, Nov. 1949, p. 74-77, 139-140; Dec. 1949, p. 72-77, 154, 156.

Pronounced segregation of carbon, and to a minor degree other alloying elements found in small steel castings adjacent to riser contacts. Centerline segregation is also found in long, slender cast sections which extend for a comparatively great distance from the riser. Typical examples and methods of prevention or minimization. Dec. issue: Effect of riser-contact design, use of exothermic and special knock-off riser cores, and effect of casting design.

14B-145. Modernized Cleaning Room Handles Wide Range of Castings. Robert H. Herrmann. *Foundry,* v. 77, Dec. 1949, p. 82-85, 218, 220, 222.

Procedures and equipment of ferrous castings cleaning room.

14B-146. Cast Iron. Arthur J. Caddick. *Mining Magazine,* v. 81, Nov. 1949, p. 271-276.

Recent progress in methods of production. Effects of different added elements in different amounts on properties and structures.

14B-147. Oxygen Enrichment in the Cupola. W. C. Newell. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1949, p. 103-108.

Analyzes probable results of oxygen enrichment. Results reported in the literature.

14B-148. Oxygen Enrichment in the Cupola. E. C. Evans. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct.

1949, p. 109-118; discussion, p. 118-119.
Critical survey of published information, including effects on refractory consumption, cost of oxygen, and methods of oxygen production.

14B-149. Can the Carbon Content of Cast Iron Melts Be Raised? *British Cast Iron Research Association Journal of Research and Development,* v. 3, Oct. 1949, p. 147-151.
Discussion of paper by J. G. Pearce. See item 14B-105, 1949.

14B-150. Making a Large Multi-Cylinder Diesel Crankcase. Part I. Core-Making. J. F. Barnes. **Part II. Moulding.** F. E. Ironmonger. *Foundry Trade Journal,* v. 87, Nov. 10, 1949, p. 565-570; Nov. 17, 1949, p. 593-601.
Procedures of British firm.

14B-151. Swords to Ploughshares. A. R. Parkes. *Foundry Trade Journal,* v. 87, Nov. 24, 1949, p. 621-628.
Layout, equipment, and procedures of new British ferrous foundry. About 60% by weight of its production consists of plowshares.

14B-152. Practical Experience With a Hot-Blast Cupola Furnace Plant. Otto Mattern. *Foundry Trade Journal,* v. 87, Nov. 24, 1949, p. 629-633. Translated and condensed.
Previously abstracted from *Die Neue Giesserei.* See item 14B-134, 1949.

14B-153. Gates and Risers as Applied to Steel Castings. Eric R. Morgan. *Journal of the Birmingham Metallurgical Society,* v. 29, Sept. 1949, p. 153-172.
Design studied from the theoretical point of view. Results are applied to a critical discussion of existing types. 10 ref.

14B-154. Um Estudo Sobre a Maleabilizaçao do Ferro Fundido. (Study of the Malleabilization of Cast Iron.) Tomio Kitice. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 389-399.
Factors determining the number and size of graphite nodules produced during malleabilization.

14B-155. Increase Refractory Life in Malleable Melting. M. J. Henley. *American Foundryman,* v. 16, Dec. 1949, p. 30-31.
Modified cupola charging equipment and method for laying the bottom which resulted in better refractory life.

14B-156. Ninth Annual Report on Investigation of Properties of Steel Sands at Elevated Temperatures. John P. Fraser and Peter E. Kyle. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 89-99.
Work done during the year 1948-1949 at Cornell University. Hot-compressive-strength characteristic of two sand mixtures over a wide range of temperatures and exposure times. Free-expansion characteristics of one sand mixture under slow heating and shock heating conditions.

14B-157. Comparative Solidification Studies. Victor Paschkis. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 100-107; discussion, p. 107-110.
Solidification rates of various steel shapes cast in sand.

14B-158. Blast Humidity as a Factor in Cupola Operation. D. E. Krause and H. W. Lownie, Jr. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 111-130; discussion, p. 130-132.
Previously abstracted from a condensation in *Industrial Heating,* item 14B-77, 1949.

14B-159. A Study of Insulating and Mildly Exothermic Antipiping Compounds Used for Steel Castings. S. L. Gertsman. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 332-340; discussion, p. 340-342.
Previously abstracted from preprint. See item 14B-46, 1949.

14B-160. Report of the Activities of the A. F. S. Cupola Research Committee. R. G. McElwee. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 384-385.
Slag and coke quality studies. Air pollution and the cupola, and the chill test for cupola operation. Lists articles published in *American Foundryman* dealing with work of the Committee.

14B-161. Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes. J. F. Wallace and J. L. Martin. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 450-455; discussion, p. 455.
Previously abstracted from preprint, item 3B-81, 1949.

14B-162. Growth and Scaling Characteristics of High-Silicon Cast Iron. W. H. White and A. R. Elsea. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 459-473; discussion, p. 473-474.
Previously abstracted from preprint. See item 14B-51, 1949.

14B-163. Influence de la température de décochage sur la graphitisation à l'etat solide des fontes blanches. (Influence of Shake-Out Temperature on the Solid-State Graphitization of White Cast Iron.) Gabriel Joly. *Fonderie,* Sept. 1949, p. 1725-1728.

Results of investigation. Method for determination of temperature of shake-out (which was varied from 190 to 760° C.).

14B-164. Défauts dans des poulies de grosses dimensions. (Defects in Large-Sized Pulleys.) Henry Gernelle and Pierre Nicolas. *Fonderie,* Sept. 1949, p. 1744-1746.

Several cases in these sand castings, giving suggested remedies in each case. Causes are either lack of sand permeability or improper metal composition.

14C—Nonferrous

14C-1. Modern Methods of Die Casting. H. L. Harvill. *Western Metals,* v. 6, Dec. 1948, p. 30-33.

Methods and equipment.

14C-2. Conserving Raw Materials. Hiram Brown. *Foundry,* v. 77, Jan. 1949, p. 80-81, 219-222.

Recommended procedures.

14C-3. Bronzes—Old and New. J. F. Buchanan. *Foundry,* v. 77, Jan. 1949, p. 196-198, 200.

The various bronzes, their compositions, methods of casting, properties, and applications.

14C-4. Pulverized Vermiculite Has Foundry Applications. Tony Willcox. *Refractories Journal,* v. 24, Nov. 1948, p. 402.

Uses as inhibitor, core wash, or refractory facing for permanent molds in the nonferrous foundry.

14C-5. American Brake Shoe Making Steel Plant Castings in New Plant. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1472-1474, 1488.

Nonferrous foundry of National Bearing Div., American Brake Shoe Co., makes miscellaneous nonferrous castings used in steel plants.

14C-6. Centrifugal Pressure Casting. Robert R. Myers. *Printing Equipment Engineer,* v. 77, Jan. 1949, p. 17-21.

Producing electrotype and stereotype curved printing plates using plastic molds followed by electrodeposition of a copper shell and casting of the plate.

14C-7. Modern Foundry Methods. *American Foundryman,* v. 15, Jan. 1949, p. 52-54. Based on paper by H. W. Bennett.

Picture story briefly describes molding of a one-piece bronze turbine-runner model casting.

14C-8. Economical Die Production. B. Baldock. *Machinery* (London), v. 74, Jan. 27, 1949, p. 117-118.

Die-casting dies in which die steels are largely replaced by cast iron.

14C-9. Die-Casting Practice and Technique. IV. Calculating Weights From Drawings. W. M. Halliday. *Metal Industry,* v. 74, Jan. 28, 1949, p. 63-65, 72.

Method by which the weight of a die casting is directly determined by calculation from drawings or blueprints.

14C-10. Casting Masters. *Esso Oilways,* v. 15, Feb. 1949, p. 1-9.

Advantages of die-cast parts over those formed in sand molds. Die-casting machines.

14C-11. Die Casting Die Design. Part II. (Continued.) H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 14, Feb. 1949, p. 57-58, 60-61, 78, 80.

Relative merits of hand and hydraulically operated cores. Other features of cores and core blocks. (To be continued.)

14C-12. Making the Trial Run on Die Casting Dies. James L. Erickson. *Tool Engineer,* v. 22, Feb. 1949, p. 24-25.

Recommended procedures.

14C-13. Melting and Casting of Non-Ferrous Metals. G. L. Bailey and W. A. Baker. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 285-310.

The requirements of good-quality castings for subsequent working; the more common defects in ingots, and the origin of these defects. The solidification process and the main features of gas-metal equilibria, including sources of dissolved gases and principles involved in methods of degassing. The various commonly used casting methods. Present knowledge of factors determining the structure of ingots. 29 ref.

14C-14. The Production of Refined-Copper Shapes. R. H. Waddington. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 311-324.

The procedure used commercially for production of standard and special shapes of electrolytic tough-pitch high-conductivity copper. Operations preceding melting and casting. Effects of variations in cathode structure; control of the electrolyte; use of addition agents; pouring methods; mold materials; control and inspection methods; and machining operations.

14C-15. Melting and Casting Aluminum Bronze Ingots for Subsequent Working. A. J. Murphy and G. T. Callis. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 325-338.

Decisive factors are the short freezing range and the tenacious film of oxide which forms on the molten metal. The oxide film gives rise to surface defects on ingots

cast with turbulent pouring but it enables a surface of exceptionally good quality to be obtained when nonturbulent methods of casting are used.

14C-16. The Application of Flux Degassing to Commercially Cast Phosphor Bronze. N. I. Bond-Williams. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 339-352.

Application of the principles of good melting and casting practice reported in papers to the Institute of Metals and other societies. The particular application considered is to the melting and casting of phosphor bronze for subsequent cold rolling.

14C-17. The Melting and Casting of Brass. Maurice Cook and N. F. Fletcher. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 353-372.

Most important features of brass-melting practices, especially those of metallurgical interest. The suitability of different types of melting units. Possible sources of contamination, means of minimizing metal loss due to oxidation, and the addition of other elements. Molds and mold treatments. 11 ref.

14C-18. The Melting and Casting of Nickel Silver at the Works of Messrs. Henry Wiggin and Co., Ltd. E. J. Bradbury and P. G. Turner. *Journal of the Institute of Metals,* v. 75, Jan. 1949, p. 373-390.

Equipment and procedures, including oil and coke-furnace crucible melting, and the special technique necessitated by the adoption of water-cooled molds for casting strip ingots.

14C-19. The "Soro" Method of Manufacturing Brass and Other Bars. *Machinery Lloyd* (Overseas Eidtion), v. 21, Jan. 29, 1949, p. 107-109.

Centrifugal-casting method is said to permit economical manufacture of bars even in small quantities. It is applicable to various nonferrous alloys.

14C-20. Modern Non-Ferrous Foundry of American Brake Shoe Co. (at Meadville, Pennsylvania) Replaces Four Old Plants. *Industrial Heating,* v. 16, Feb. 1949, p. 214-216, 218, 220, 222, 224, 226, 325-326, 328.

14C-21. Die-Casting Practice and Technique. V. Gravity or Pressure? W. M. Halliday. *Metal Industry,* v. 74, Feb. 4, 1949, p. 87-90.

Pros and cons of the two methods.

14C-22. New Nonferrous Foundry Incorporates Outstanding Working Conditions. William G. Gude. *Foundry,* v. 77, Mar. 1949, p. 70-75.

Equipment and procedures of Meadville, Pa., plant of National Bearing Div., American Brake Shoe Co.

14C-23. Use of Lithium Cartridges in Treating High-Conductivity Copper and Copper-Base Alloys. P. E. Landolt and F. R. Pyne. *Foundry,* v. 77, Mar. 1949, p. 90-91, 262,-263.

Use of cartridges consisting of a definite amount of metallic lithium hermetically sealed in copper tubing and available in three sizes. Their use avoids several disadvantages connected with use of pure Li metal or even Li master alloys.

14C-24. Die-Casting Practice and Technique. VII. Layout Drawing. W. M. Halliday. *Metal Industry,* v. 74, Feb. 25, 1949, p. 143-145; Mar. 4, 1949, p. 169-173.

Standard layout form; flash, sprues, runners, and spray produced from a two-cavity combination die. Die lubrication and gravity dies. Second installment: colored and detail drawings; checking; machining limitations; common deficiencies; dimensioning; and method of projection.

14C-25. Contract Production and Finishing of Die Castings. *Machinery* (London), v. 74, Feb. 24, 1949, p. 243-248.

Production of miscellaneous die castings by British firm.

14C-26. Zum Schmelzen und Giessen von Aluminium-bronzen. (The Melting and Casting of Aluminum Bronzes.) Edmund R. Thews. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Oct. 1948, p. 110-116.

The properties of aluminum bronzes alloyed with Fe, Ni, Mn, Pb, and Si; the effect of scrap, special elements, fluxes, and oxidants; the method of melting and alloying, melting and pouring temperatures, mold materials, shrinkage, gates, risers, chill plates, moisture content and air-permeability of the molding sand, cooling, centrifugal and pressure casting. 10 ref.

14C-27. (Book.) **Moulds for Plastics.** W. M. Halliday. 259 pages. Temple Press, Ltd., Bowling Green Lane, London, E.C.1, England. 30s.

This textbook will be of value to those concerned with the design and production of die-casting dies, since so many of the practices in injection-mold design are common to those for die-casting dies. Contains detailed examination of coring, ejectors, sleeves, dowels, slides. (From review in *Die Castings.*)

14C-28. Bushings and Bearings From San Francisco. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 78-81.

Production of bronze bushings and bearings. The plant is fully integrated from melting furnaces to warehouses. Melting, mold making, core making, casting, machining, and storage are all provided.

14C-29. Cast Bronze Bushings. Leighton M. Long. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 131-135; discussion, p. 136-137; 146-147.

Effects of variations in casting and machining procedure on properties.

14C-30. Metal Melting and Its Relation to Gases in Metal. O. Edwin Decker. *American Foundrymen's Society,* Preprint No. 10, 1949, 3 pages.

Suggestions for melting brasses and bronzes to produce sound castings. Proper melting furnace design, size of crucible in relation to furnace, proper control and furnace maintenance.

14C-31. Recent Developments in Theory and Practice of Insulating Sleeves, Pads, and Risers for Non-Ferrous Casting. Kurt A. Miericke. *American Foundrymen's Society,* Preprint No. 17, 1949, 4 pages.

14C-32. Gas-Fired Melting of Copper-Base Alloys in a Reducing Atmosphere. Donald C. Caudron. *American Foundrymen's Society,* Preprint No. 53, 1949, 3 pages.

Advantages.

14C-33. Naadloos gietwerk. (Seamless Castings.) B. Vlasblom. *Metalen,* v. 3, Feb. 1949, p. 130-134.

A method of seamless casting applicable to metals with low melting points. Comparison with other methods from the viewpoints of cost and quality of castings. Advantages.

14C-34. Nichteisenmetall-Schleuderguss und Schleuderverbundguss. (Nonferrous Centrifugal Casting and Centrifugal "Bonded" Casting.) Gunther Schwietzke. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Feb. 1949, p. 35-39.

An illustrated study of different centrifugal-casting processes. Their various uses and properties.

14C-35. Bronze Rod. W. T. Pell-Walpole and V. Kondic. *Metal Industry,* v. 74, Mar. 18, 1949, p. 203-206.

Production of small lengths of high-quality rod in a simple semi-continuous machine. Most of the desirable features of continuously cast bronze can be obtained with this inexpensive plant by any foundry normally producing chill cast bronzes by static casting methods. 11 ref.

14C-36. Production of Thin-Walled Die Castings. H. K. Barton. *Machinery* (London), v. 74, Mar. 31, 1949, p. 415-418.

Advantages of thinner walls. Use of composite cores; prevention of distortion during ejection; and elimination of ejector marks.

14C-37. (Book) Non-Ferrous Castings. R. F. Hudson. Chapman & Hall, 37 Essex Street, London, W.C.2, England. 22s. net.

Stated purpose is to "bring the scientific viewpoint to the practical man." Raw materials used in the nonferrous foundry; nonferrous molding sands, and the effect of various constituents and additions; effect of additions to sand, and thermal conductivity of sands and special molding mixtures; sand testing, core sands and core binders (no information is given regarding phenol formaldehyde or urea formaldehyde). Melting and molding practice including types of furnaces, crucibles, and their maintenance, and the correct melting technique for tin bronzes, high-tensile bronzes, nickel bronze, and other special alloys.

14C-38. Problem of Gases in the Indirect-Arc Furnace; Melting Brass and Bronze. Martin G. Dietl. *American Foundryman,* v. 15, Apr. 1949, p. 99-102.

Causes of gassed metal, indicating that the defect is caused by "outside" influences rather than by use of the above type of furnace. Recommended procedures for minimizing this condition, for Cu-Sn alloys and for brasses containing considerable Zn and P. 11 ref.

14C-39. Die-Casting Practice and Technique. IX. Gravity Die Design Forms. W. M. Halliday. *Metal Industry,* v. 74, Apr. 1, 1949, p. 247-250; Apr. 8, 1949, p. 271-273.

Design principles.

14C-40. Die-Casting Practice and Technique. X. Forms of Gravity Die Designs. W. M. Halliday. *Metal Industry,* v. 74, Apr. 15, 1949, p. 290-292; Apr. 22, 1949, p. 307-310.

Described and diagrammed.

14C-41. Art Foundry Practice. A. R. Wizard. *Foundry Trade Journal,* v. 86, Apr. 28, 1949, p. 389-395; discussion, p. 395-397.

Various procedures for bronze founding of statues. Steps in the production of the Roosevelt statue erected in London.

14C-42. Die Casting Die Design. Part III. (Continued.) H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 15, May 1949, p. 51-52, 54.

Relative merits of different designs for a simple casting and for a tube fitting with branches set at an angle of 85° to the axis of the main bore. (To be continued.)

14C-43. Zinc Alloys for Blanking and Forming Dies. Gilbert P. Muir. *Tool Engineer,* v. 22, May 1949, p. 32-33.

Temporary dies for sheetmetal working result in marked economies. Making of the pattern, foundry practice, and design considerations.

14C-44. (Book) **Process Control of Brass and Bronze Foundry Procedure.** 87 pages. *Society of Automotive Engineers, Inc.,* 29 West 39th St., New York 18, N. Y. $4.00, nonmembers; $2.00, members. (Special Publication 52.)

Result of the work of an SAE subcommittee. Applications, composition, and properties; test bar practices; brass and bronze foundry molding and core sand; alloying and melting of copper, brasses, bronzes; sand casting of brass and bronze; centrifugal casting of brass and bronze; pressure casting of brass and bronze; plaster mold method of casting brass and bronze; salvage-reclamation of castings by repairs; and inspection.

14C-45. Mass Methods Boost Rotor Output to 30 Times Pre-War. *Western Metals,* v. 7, May 1949, p. 26-27.

Die-casting and stamping operations used in production of motor rotors.

14C-46. The Mint, Birmingham: Brass and Copper Strip and Tube. N. H. Moseley. *Metal Industry,* v. 74, May 13, 1949, p. 379-382.

Casting, hot rolling, milling, and tube rolling.

14C-47. Some Examples of Modern Die Casting Technique. *Machinery* (London), v. 74, May 26, 1949, p. 698-703.

14C-48. Die-Casting Practice and Technique. XI. Basic Gravity Die Design (Multiple Form Blocks). W. M. Halliday. *Metal Industry,* v. 74, May 13, 1949, p. 387-389, May 20, 1949, p. 405-406.

Aligning by chase ring, location of chase ring, cavity formations, typical component design, determination of parting-lines, use of dowels, runner channels, and die-design modifications.

14C-49. Die-Casting Practice and Technique. XII. Basic Gravity Die Designs (Two Form Blocks). W. M. Halliday. *Metal Industry,* v. 74, May 27, 1949, p. 424-426.

Vertical and horizontal types, method of feeding, and advantages of above type.

14C-50. Fundamental Characteristics of Casting Fluidity. V. Kondic and H. J. Kozlowski. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 665-678.

Novel apparatus used to study effects of degree of superheat, mold temperature, composition of certain binary alloys, and modification of Al-Si alloys on casting fluidity. A straight-line relationship between fluidity and absolute temperature was found for a number of pure metals. Certain previously established relationships between casting fluidity and composition of binary alloys were confirmed for the Pb-Sn and Al-Si systems. 12 ref.

14C-51. New Grid Casting Improves Battery Life. Eugene Willihnganz. *Iron Age,* v. 163, June 9, 1949, p. 62-65.

Development of a new grid design and improved casting techniques which are expected to result in substantial increases in service life of industrial storage batteries through the elimination of shrinkage porosity.

14C-52. Attaques et masselottes en fonderie de bronze et de laiton. (Sprues and Risers in Bronze and Brass Foundry Practice.) Joseph F. Nixon. *Fonderie,* Feb. 1949, p. 1465-1475; discussion, p. 1476-1477.

Influence on quality of finished castings. Other factors such as the human element.

14C-53. Nitrogen Degassing of Nonferrous Metals. T. W. Eselgroth. *Metal Progress,* v. 55, June 1949, p. 817-820.

Procedures and equipment. Advantages over other methods.

14C-54. Melting and Casting of Brass. *Industrial Heating,* v. 16, June 1949, p. 1006-1008. Condensed from paper by Maurice Cook and N. L. Fletcher.

Previously abstracted from *Journal of the Institute of Metals,* item 14C-17, 1949.

14C-55. Melting and Casting of Silver Nickel. *Industrial Heating,* v. 16, June 1949, p. 1008. Condensed from paper by E. J. Bradbury and P. G. Turner.

Previously abstracted from *Journal of the Institute of Metals,* item 14C-18, 1949.

14C-56. Cause and Prevention of Gas

Porosity in Copper-Base Alloys. *Foundry,* v. 77, July 1949, p. 147-148. Reprinted from "Copper-Base Casting Alloys" (Federated Metals Div., American Smelting & Refining Co., New York).

Brief summary of causes and recommendations for preventive refining, melting, and pouring procedures.

14C-57. Die-Casting Practice and Technique. XIII. Die Block Locking Mechanisms. XIV. Features of Semi-Permanent Gravity Die Designs. W. M. Halliday. *Metal Industry,* v. 74, May 20, 1949, p. 447-449; June 10, 1949, p. 467-469; June 17, 1949, p. 486-488.

14C-58. Problems in Bronze Foundry Practice. Austen J. Smith. *Engineering,* v. 167, June 17, 1949, p. 557-558; *Foundry Trade Journal,* v., 86, June 23, 1949, p. 615-620.

Mechanics of solidification of brass and bronze alloys, and a few of the factors that interfere with normal solidification processes.

14C-59. The Use of Collapsible Cores. H. K. Barton. *Machinery* (London), v. 74, June 30, 1949, p. 889-895.

Use in die casting in cases in which the work must be cast with undercuts which make ejection from a solid core impracticable.

14C-60. Die Casting Hinged Assemblies. Newman Field. *Machinery* (London), v. 74, June 30, 1949, p. 895-896.

Novel die-casting technique introduced in 1948 by J. R. Schuchardt, of New York, for production, in a single shot, of die-cast assemblies consisting of two or more parts hinged to one another. The method is in commercial use for production of zipper fastener sliders. Other applications.

14C-61. Research Will Advance Brass and Bronze Foundry Practice. Austen J. Smith. *American Foundryman,* v. 16, July 1949, p. 44-49.

Previously abstracted from *Foundry Trade Journal, and Engineering,* items 14C-58, 1949.

14C-62. ASARCO's Continuous Casting Process. *Engineering and Mining Journal,* v. 150, July 1949, p. 145.

Process developed by American Smelting & Refining Co. at Perth Amboy, N. J. Applied to Cu-base alloys, it not only simplifies the production of accurately-dimensioned castings, but imparts greater strength and hardness than other conventional processes. It also permits casting of shapes in lengths hitherto not possible by usual methods.

14C-63. Precision Casting of Copper-Base Alloys at Warren Foundry. Fred M. Burt. *Western Metals,* v. 7, July 1949, p. 30-31.

14C-64. Bronze Foundry Practice; Problems Relating to the Mechanics of Solidification. Austen J. Smith. *Metal Industry,* v. 75, July 1, 1949, p. 10-13.

Previously abstracted from *Foundry Trade Journal,* and *Engineering,* item 14C-58, 1949.

14C-65. Trends in Methods of Melting and Casting for High Conductivity Copper Wire Bars. R. H. Bauld. *Institution of Mining and Metallurgy,* Preprint No. 7 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 18 pages.

Major steps already taken to depart from the reverberatory type of refining and casting on wheels with horizontal molds open to the atmosphere. 19 ref.

14C-66. Motor Cycle Castings. *Metal Industry,* v. 75, July 15, 1949, p. 46-47.

Production of ferrous and nonferrous castings for motorcycle components by a British firm.

14C-67. Four Second Cycle Die Casting. Walter R. Ellis. *Applied Hydraulics,* v. 2, Aug. 1949, p. 6-7, 18-19.

A 4-sec. or shorter cycle for die casting 8-oz. shots was made possible by the use of a low-pressure-operated intensifier assembled integrally with the die-closing cylinder.

14C-68. Safety Devices for Die Casting Dies. H. K. Barton. *Machinery* (London), v. 75, July 28, 1949, p. 132-138.

14C-69. Coulée en coquille des bronzes d'aluminium. (Chill Casting of Aluminum Bronzes.) Maurice Billing and George Blanc. *Fonderie,* May 1949, p. 1593-1597.

Results of experimental investigation indicate that gravity casting in metal molds is most suitable. Recommended procedures.

14C-70. Die Zinkgusslegierung Zn-Al 2, Cu 1. (The Cast Zinc Alloy Containing 2% Al and 1% Copper.) Karl Löhberg. *Zeitschrift für Metallkunde,* v. 40, June 1949, p. 220-224.

Conditions for pressure casting of the above alloy as well as its mechanical and corrosion-resistant properties.

14C-71. Trvale magnety lite do pisku. (Sand Cast Permanent Magnets.) J. Zampach and O. Starosta. *Hutnické Listy,* v. 4, Jan. 1949, p. 14-17; Feb. 1949, p. 51-52.

Production of permanent magnets of the Al-Ni-Cu-Co-Ti and Al-Ni-Cu-Co types. Heat treatment and magnetic properties.

14C-72. Safety Devices for Die Casting Dies. H. K. Barton. *Machinery* (London), v. 75, Aug. 25, 1949, p. 278-284.

Devices designed to prevent injection of molten metal unless all the separate die elements are in a prescribed positional relationship. Second of two articles.

14C-73. Producing Nonferrous Sand Castings to Close Tolerances. Herbert Chase. *Foundry*, v. 77, Sept. 1949, p. 90-95, 184, 186, 189-190.

Procedures and equipment at Sperry Gyroscope Co.

14C-74. How To Control Fumes in Nonferrous Melting. Robert H. Haley. *Foundry*, v. 77, Sept. 1949, p. 118, 121.

Recommended procedures designed to meet California's new law regarding atmospheric pollution, without use of collection systems.

14C-75. Anderung der Eigenschaften von Zink-Druckgusslegierungen bei Raumtemperatur. (Changes in the Properties of Zinc Pressure-Cast Alloys at Room Temperature.) Erich Meyer-Rässler. *Zeitschrift für Metallkunde*, v. 40, July 1949, p. 270-274.

The effect of aging (up to two years) on the hardness, strength, and elongation of five different zinc alloys was investigated. The greatest changes occurred during the first few months and pouring temperatures (420-560° C.) and mold temperatures (130-175° C.) had little effect on strength. Secondary zinc was found to be as good as primary zinc.

14C-76. Nickel für Radiorohren. (Nickel for Radio Tubes.) H. Weber. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 198.

Melting, methods of processing the ingots, and causes of production difficulties. Hardness and analytical data.

14C-77. A Study of Arc-Melted Molybdenum-Rich Chromium-Molybdenum Alloys. H. D. Kessler and M. Hansen. *American Society for Metals*, Preprint No. 33, 1949, 24 pages.

Cr-Mo alloys containing 60-100% Mo were arc melted and cast in an argon atmosphere. The melting method consisted in fusing consumable electrodes made by powder-metallurgical techniques. C and Be were investigated as possible deoxidizers. Measured lattice parameters check the results of other investigators, and the body-centered cubic alloys show complete solid solubility. Oxidation resistance in static air was evaluated at 1200, 1500, and 1800° F. Forgeability and hardness were also studied. 24 ref.

14C-78. Quality Control Review. Tests for Brass, Bronze, and Nickel Alloy Castings. William Romanoff. *American Foundryman*, v. 16, Sept. 1949, p. 40-49.

Various quality control procedures, including temperature control, mechanical testing, fluidity testing, nondestructive testing, sand control, and metallography.

14C-79. Asarco Continuous Cast Shapes —Their Manufacture and Use. J. S. Smart, Jr., and A. A. Smith, Jr. *Iron Age*, v. 164, Sept. 22, 1949, p. 67-72.

Crucible construction, graphite die design, and cooling and casting techniques used with the Asarco process for continuously casting tin bronze alloys. Sizes, tolerances, properties, and shapes (including tubular forms) in which metal can be cast by the process. Varied uses to which such material has been put. Features which lend the process to production of job-lot quantities.

14C-80. Melting and Casting Zirconium Metal. W. J. Kroll and H. L. Gilbert. *Journal of the Electrochemical Society*, v. 96, Sept. 1949, p. 158-169.

Manner of heating, furnace design, crucible materials, and methods of casting. For the experiments, a high-frequency furnace, an arc furnace, and a split-tube graphite-resistor furnace were used. Preference is given the latter for vacuum fusion while the high-frequency and arc furnaces are well adapted for melting in a noble gas atmosphere. Crucible materials, melting in graphite, and casting of ingots. 19 ref.

14C-81. Casting and Machining Zinc Alloy Carburetor Parts. Herbert Chase. *Iron Age*, v. 164, Sept. 29, 1949, p. 66-68.

Production at a high level—averaging up to 500 parts per hr.—through the effective use of handling, casting, trimming, machining, and finishing equipment.

14C-82. More Accurate Castings. L. T. Schakenback. *Metal Progress*, v. 56, Oct. 1949, p. 489-490.

Procedure using mercury pattern for a Cu casting requiring accurate interior surfaces.

14C-83. Eliminate Machining. Leonard G. Daniels. *Metal Progress*, v. 56, Oct. 1949, p. 490-491.

Advantages of single investment castings for a variety of metals to replace complex assemblies. Operations for shuttle lifter and feeder on a weaving machine.

14C-84. Centrifugal Casting of Taurus Bronze. *Machinery*, v. 75, Sept. 15, 1949, p. 385.

Practice of a British firm for casting phosphor bronze gears.

14C-85. New Nonferrous Foundry Is Clean, Light, Well Planned. Robert H.

Herrmann. *Foundry,* v. 77, Oct. 1949, p. 82-83, 214-215.

Central Brass & Aluminum Foundry, St. Louis.

14C-86. Effect of Foundry Practice on Properties of Some Binary Copper-Silicon Alloys. A. I. Krynitsky, W. P. Saunders, and H. Stern. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 152-163; discussion, p. 164-165.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-27. See item 14c-32, 1948.

14C-87. Ingot Metal vs. Virgin Metal. Fred L. Wolf. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 576-578; discussion, p. 578-579.

Previously abstracted from *American Foundryman.* See item 14c-37, 1948.

14C-88. Gas Porosity in Nickel-Silver Castings. T. F. Pearson, W. A. Baker, and F. C. Child. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A123-A129; discussion, p. A129-A130.

See abstract from *Metal Industry,* item 14c-42, 1948.

14C-89. The Casting of Marine Bronze Propellers. F. J. Tector and J. Martland. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B104-B117.

Previously abstracted from *Foundry Trade Journal,* July 22 and July 29, 1948. See item 14d-46, 1948.

14C-90. Safety Devices for Die Casting Dies. H. K. Barton. *Machinery* (London), v. 75, Sept. 29, 1949, p. 458-462.

Methods used to ensure that core withdrawal takes place correctly, and before ejection is attempted.

14C-91. Why Not Use More High Shrinkage Bronze? Harold J. Roast. *Foundry,* v. 77, Nov. 1949, p. 93, 231-236.

Merits of Al and Mn bronzes for high-strength applications. Because of casting difficulties, these alloys have been avoided by many foundries. Recommended procedures for casting.

14C-92. Sleeve Bearing Production Involves Unusual Casting and Machining Procedures. Herbert Chase. *Steel,* v. 125, Oct. 24, 1949, p. 61-63.

14C-93. A Special Die-Casting Method. E. M. H. Lips. *Foundry Trade Journal,* v. 87, Oct. 6, 1949, p. 425-428.

Vacuum die-casting machine developed for production of castings free of inclusions. For normal use, small air inclusions are not harmful, but in special cases their presence may render the product useless. Advantages of the process, which has been applied to Pb and Zn alloys.

14C-94. Economics of Owning a Pressure Die Casting Machine. Eric James. *Light Metal Age,* v. 7, Oct. 1949, p. 8-11, 31-32.

Factors and costs to be considered in deciding whether to make one's own die castings or purchase them. A series of tables lists auxiliary items and pieces of equipment needed in a die-casting plant.

14C-95. Metallurgical Aspects of Heat Checking in Brass Die Casting Dies. Part Two. (Concluded.) A. E. Nehrenberg. *Die Castings,* v. 7, Nov. 1949, p. 33-35, 61-68.

Effects of heating in service on microstructures. Results of examination of welded areas in brass die-casting dies and of cores used in brass die casting. 13 ref.

14C-96. Production Processes; Their Influence on Design. Part XLVIII. Die Casting. Roger W. Bolz. *Machine Design,* v. 21, Nov. 1949, p. 115-124.

14C-97. Casting Parts for Jet-Propulsion Units by the Lost Wax Method. *Machinery* (London), v. 75, Oct. 27, 1949, p. 608-610.

14C-98. Casting and Machining Pure Silver Bottles. W. C. Ellis. *American Foundryman,* v. 16, Nov. 1949, p. 60.

Fifty pure silver bottles were required for the transportation of a rare chemical substance—a product of atomic research. Development of satisfactory procedures for making them. Metal molds were used.

14C-99. Continuous Casting at Bristol Brass. J. H. Hyde. *Iron Age,* v. 164, Dec. 8, 1949, p. 80-85.

Operation of the Rossi continuous-casting machine. Advantages resulting from installation of this unit and from mechanization of material-handling operations. Greater uniformity of analysis of continuously cast stock has been achieved.

14C-100. Centrifugal Casting of Nonferrous Alloys. Herbert Chase. *Foundry,* v. 77, Dec. 1949, p. 94-97, 127.

Equipment and procedures of Allis-Chalmers Mfg. Co.

14C-101. The Conversion of Existing Parts to Production by Die Casting. H. K. Barton. *Machinery* (London), v. 75, Nov. 24, 1949, p. 754-762.

A variety of die-cast parts and assemblies formerly made by stamping, forging, plastic molding, sand casting, etc. Design principles.

14C-102. Production Processes; Their Influence on Design. Part XLIX. Plaster-Mold Casting. Roger W. Bolz. *Machine Design,* v. 21, Dec. 1949, p. 141-145.

14C-103. Arc Melting Molybdenum-Rich Alloys. *Iron Age,* v. 164, Dec. 15, 1949, p. 82. Condensed from "A Study of Arc-Melted Molybdenum-Rich Chromium-Molybdenum Alloys", by H. D. Kessler and M. Hansen, *American Society for Metals,* Preprint No. 33, 1949.

Previously abstracted from original, item 14C-77, 1949.

14C-104. Problems in Bronze Foundry Practice. Austen J. Smith. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 45-50.

Previously abstracted from *Engineering,* item 14C-58, 1949.

14C-105. Recent Developments in Theory and Practice of Insulating Sleeves, Pads, and Risers for Non-Ferrous Casting. Kurt A. Miericke. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 204-207; discussion, p. 207-209.

Previously abstracted from preprint. See item 14C-31, 1949.

14C-106. Metal Melting and Its Relation to Gases in Metal. O. Edwin Decker. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 354-356; discussion, p. 356.

Previously abstracted from preprint. See item 14C-30, 1949.

14C-107. Gas-Fired Melting of Copper-Base Alloys in a Reducing Atmosphere. Donald C. Caudron. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 558-560; discussion, p. 560-561.

Previously abstracted from preprint. See item 14C-32, 1949.

14C-108. Problem of Gases in the Indirect-Arc Furnace Melting of Brass and Bronze. Martin G. Dietl. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 597-600; discussion, p. 600-601.

Previously abstracted from *American Foundryman,* item 14C-38, 1949.

14D—Light Metals

14D-1. Induction Melting and Improved Technique Increase Rotor-Casting Efficiency at Reliance Electric's Ashtabula Plant. *Industrial Heating,* v. 15, Dec. 1948, p. 2080, 2082, 2084, 2086, 2088, 2176, 2178.

Facilities of America's first motor manufacturer to successfully pressure-cast aluminum rotors as large as 30 in. in diameter.

14D-2. Model Foundry Controls Aircraft Castings. Paul Graham. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 80-83, 107.

Experimental aluminum foundry of North American Aviation at Inglewood, Calif.

14D-3. Aluminum Alloy Pressure Moldings. James L. Erickson. *Aero Digest,* v. 58, Jan. 1949, p. 46-47, 86.

Various parts pressure molded by cold-chamber machines. Their complex nature illustrates cost savings over machined parts. Comparative mechanical properties.

14D-4. Aluminum Cast in Plaster. *SAE Journal,* v. 57, Jan. 1949, p. 60-61. Based on "Relation of the Antioch Process to the Foundry," by E. A. Canning.

Plaster-mold process used to cast Allison aircraft-engine parts and elements of the Buick Dynaflow transmission. It is similar to the wax-and-plaster process developed at Antioch College, but uses gypsum as the basic raw material, mixed with sand, asbestos, talc, and sodium silicate. The process is expensive and should be used in producing parts of complicated design which cannot be made more economically by other methods.

14D-5. Einfluss der Absenkgeschwindigkeit beim Wassergussverfahren auf die Eigenschaften der Stränge und der daraus hergestellten Bleche. (Effect of Cooling Rate During Water-Cooled Casting on Properties of Bars and Sheets Rolled From Them.) Hans Bothmann and Hugo Vosskuhler. *Zeitschrift fur Metallkunde,* v. 39, Jan. 1948, p. 13-17.

Effects of cooling on the properties of Al-Cu-Mg alloys when the molds were submerged in water at rates varying from 4 to 12 cm. per min. were studied. Results show that the increased rate of cooling increases the tensile strength and yield point, but decreases the elongation. The higher rate of immersion also had a favorable effect on rolling process.

14D-6. Melting and Casting Titanium. *Iron Age,* v. 163, Jan. 13, 1949, p. 58-59, 107.

Reviews proceedings of recent symposium in Washington.

14D-7. Light Alloy Castings. *Metallurgia,* v. 39, Dec. 1948, p. 94-96.

A number of examples.

14D-8. (Book). **La Fonderie des Alliages Légers.** (The Light Alloy Foundry). R. Perret. Dunod, 92 Rue Bonaparte, Paris 6, France. 680 fr.

Preparation of the virgin metal and classification of foundry alloys. Studies of the Al-Cu, Al-Si, Al-Zn, and other light alloys. The chapter devoted to the subject of control is thoroughly practical and can be recommended for study. After a sur-

vey of melting practice, which includes information on alterations arising in melting due to gas absorption and the like, there is a chapter on heat treatment. Finally, 35 pages are devoted to defects and their cure. (From review in *Foundry Trade Journal.)*

14D-9. Die Casting Aluminum and Magnesium Alloys. Part 2. Selecting the Aluminum or Magnesium Die-Casting Alloy. *Modern Metals,* v. 4, Jan. 1949, p. 18-21. Reprinted from book recently published by Aluminum Co. of America.

Selection of the proper light alloy, desired properties, commonly used alloys and their analysis, allowable impurities, corrosion resistance, mechanical properties, and physical properties of Al and Mg.

14D-10. The Antioch Process of Metal Casting. E. A. Canning. *Foundry,* v. 77, Feb. 1949, p. 74-77, 230, 232, 234.

Previously abstracted from *SAE Journal.* (See item 14D-4, 1949.)

14D-11. Zur Frage der Verbesserung der Anschnitt- und Formtechnik bei Leichtmetallguss. (The Problem of Improving Gating and Molding Techniques in Light-Metal Casting.) G. Seumel. *Metall,* June 1948, p. 185-188.

Experiments with Silumin and beta-Silumin alloys.

14D-12. Comparison of Common Aluminum Casting Alloys. Robert S. Burpo, Jr. *Materials & Methods,* v. 29, Feb. 1949, p. 85, 87.

A tabular presentation of compositions, types of casting for which suitable, characteristics and uses, and standard specifications.

14D-13. Moulage en coquille par gravité des alliages d'Aluminium. (Gravity Chill Casting of Aluminum Alloys.) Jean Duport. *Fonderie,* Nov. 1948, p. 1371-1388.

Comparison with other methods of casting commonly used in France. Advantages and disadvantages; a series of practical hints.

14D-14. Why Die Castings? R. F. Hauser. *Modern Metals,* v. 5, Feb. 1949, p. 18-21.

Advantages and limitations of die casting especially as applied to Al and Mg.

14D-15. Die Lubricants for Light Metal Die Casting. Eric James. *Light Metal Age,* v. 7, Feb. 1949, p. 12-13, 20, 27.

Correct selection and application of die lubricants for light-metal die casting.

14D-16. 2500-Lb. Aluminum Casting Produced in Britain. *Foundry,* v. 77, Mar. 1949, p. 136.

Method of production of a pulley to be used in connection with a drive for oil-field slush pumps.

14D-17. La coulée tranquille dans les moulages au sable des alliages légers. Incidences de la coulée en source dans l'alimentation des moules. (Static Casting of Light Alloys in Sand Molds. Effect of Bottom Casting on the Feeding of the Mold.) André Caillon. *Revue de l'Aluminium,* v. 26, Jan. 1949, p. 3-13.

Basic principles. Advantages of such methods with respect to the quality of finished products. Optimum conditions and factors to be considered.

14D-18. (Book.) **Aluminum Alloy Castings.** Floyd A. Lewis. 64 pages. Aluminum Association, 420 Lexington Ave., New York 17, N. Y. 50c.

Reprints of 12 articles originally published in *Foundry* and two in *Steel.* Based upon a postwar survey sponsored by the foundry division of the Aluminum Association.

14D-19. Aluminum Castings. S. A. J. Sage. *Metallurgia,* v. 39, Feb. 1949, p. 202-205.

Some aspects of molding, casting, inspection, and testing which contribute to the production of high-quality and complex castings.

14D-20. Sable pour moulage de Magnésium. (Sand for Casting of Magnesium.) Pierre Nicolas. *Fonderie,* Jan. 1949, p. 1456.

Recommends use of a sand containing 9-12% clay, having an AFS fineness index of about 100, plus 4% sulfur and 0.25% boric acid to create an inert atmosphere.

14D-21. Light-Alloy Founding in France. *Light Metals,* v. 12, Apr. 1949, p. 180-187; discussion, p. 187. Based on review by Charles Roinet, *Revue de l'Aluminium,* June, July, and Sept. 1948.

Severely criticizes the general state of development and technique in the French industry.

14D-22. Correlation of Cooling Curve Data With Casting Characteristics of Aluminum Alloys. E. E. Stonebrook and W. E. Sicha. *American Foundrymen's Society,* Preprint 7, 1949, 8 pages.

Cooling-curve data for a number of commercial Al casting alloys were used to develop a type of solidification curve which shows with reasonable accuracy the relative proportions of an alloy solidifying

at different temperatures. This fundamental study of the effect of alloy composition on the manner in which solidification occurs is supplemented by a mathematical method of analysis.

14D-23. Cast Large Aluminum Wheel; Dry Sand Cores Used as Pattern Equipment. Louis Schmidt. *American Foundryman*, v. 15, Apr. 1949, p. 133-135.

Unusual pattern equipment and molding method used to cast a wheel 72 in. in diameter, with a maximum height of 33 in. and a finished weight of about 1000 lb. No two sections between the spokes were of equal dimensions and average wall thickness was only $\frac{7}{16}$ in.

14D-24. Heat and Temperature Control in the Die Casting of Light Metals. James L. Erickson. *Light Metal Age,* v. 7, Apr. 1949, p. 12-13, 21-24, 29.

Recommended procedures.

14D-25. Magnesium Casting Operations at West Coast Plant. W. J. Granberg. *Light Metal Age,* v. 7, Apr. 1949, p. 14-15.

Procedures and equipment of Morley Magnesium Foundries.

14D-26. Diesel Pistons; An Improved Specialloid Design Made by New Production Methods. *Automobile Engineer*, v. 39, Apr. 1949, p. 147-149.

Type made by British firm of Specialloid, Ltd. Stress distributions determined experimentally for different designs, on the basis of which the design adopted was developed. Die-casting procedure. Comparative fatigue properties of pieces from five different locations from chill-core and sand-core pistons show superiority of the former.

14D-27. Automatic Ladling. *Die Castings*, v. 7, May 1949, p. 31-33, 66.

Development of an automatic ladling unit for transferring molten aluminum into the die-casting injection cylinder promises to speed production and reduce rejects.

14D-28. Magnuminium Castings. F. McKenning. *Machinery Lloyd* (Overseas Edition), v. 21, Apr. 23, 1949, p. 80-84.

Production, properties, analysis and testing of above commercial Mg-Al alloys.

14D-29. Uber dinige Betriebserfahrungen in einem Aluminiumschmelzwerk. (Several Plant Experiences in an Aluminum Foundry.) G. Seumel. *Metall,* Oct. 1948, p. 324-325.

Desecribes and diagrams a furnace designed to melt and refine aluminum scrap especially from airplanes. A graph shows the range of iron content in a series of 301 melts.

14D-30. Points durs dans les alliages légers de fonderie. Aspects, compositions, causes remedes. (Hard Inclusions in Light-Alloy Castings. Nature, Composition, Causes, and Remedies.) Marcel Bardot and Guy Duport. *Fonderie,* Feb. 1949, p. 1478-1490; discussion, p. 1490.

Results of extensive investigation first in the laboratory, then on a commercial scale. Inclusions and their composition. Conclusions.

14D-31. Light Alloy Casting. *Metal Industry*, v. 74, June 10, 1949, p. 459-463.

British plant experience. Includes heat-treating department.

14D-32. Le refroidissement des moules dans la coulée en source des alliages légers. (Cooling of the Mold During Bottom Casting of Light Alloys.) André Caillon. *Revue de l'Aluminium,* v. 26, May 1949, p. 151-157.

Problems involved in cooling without harmful distortion and shrinkage. Proper use of chills in the lower parts and maintenance of heat in the upper part by use of feeders. Pouring speed and pouring temperature should also be properly controlled.

14D-33. Long Core Pull for Die Cast Magnesium Chair. T. Caldwell, Jr. *Die Castings,* v. 7, July 1949, p. 21, 60-61.

Procedure used for fabricating folding chairs.

14D-34. Heating Elements Cast as Inserts. *Die Castings,* v. 7, July 1949, p. 34-36, 66-67.

Procedure for casting tubular type electrical heating elements as inserts in Al die castings.

14D-35. Examples of Aluminum-Alloy Foundry Practice. J. Caven and H. W. Keeble. *Foundry Trade Journal,* v. 86, June 23, 1949, p. 621-626; June 30, 1949, p. 639-648.

Basic features of various production methods. Handling jobbing or semi-jobbing quantities on a self-contained sand-molding-machine circuit; production and heat treatment of large diesel engine piston castings; making a large paraboloid-shaped casting by the gravity die method; and a special-purpose die casting made with a sand core. The second installment gives varied examples of large sand and die cast Al pieces. Heat treatment procedure for diesel engine pistons.

14D-36, (Book). **The Production of Magnesium Castings.** G. B. Partridge. 89 pages. Kennedy Press, Ltd., 31 King St. West, Manchester 3, Eng-

land. (Metallurgia Monograph No. 1.) 4s., 6d.

Begins with magnesium extraction and manufacture of the Elektron alloys, followed by chapters on the various casting techniques. Final sections deal with commercial applications, economic factors, and design principles. Explains foundry methods and layout. Both theory and practical requirements.

14D-37. Some Notable Aluminium-Alloy Castings. A. R. Martin. *Engineering,* v. 168, July 1, 1949, p. 21-23; July 8, 1949, p. 45-46. A condensation.

A variety of complex sand and die castings. Chosen to illustrate, not only the specialized technique and metallurgical control necessary for production of high-strength Al-alloy castings, but where possible, points of interest relating to die design and the construction of pattern and core-box equipment. Two binary Al alloys containing 10% Mg and 4½% Cu, respectively, were used.

14D-38. Casting Light Alloys. *Metal Industry,* v. 75, July 1, 1949, p. 3-6.

Procedures and equipment of British plant.

14D-39. Diecasting Auto Inner Door Frames in Aluminum. W. G. Patton. *Iron Age,* v. 164, July 21, 1949, p. 90-93.

14D-40. Pimpling of Aluminum Die Castings. R. A. Quadt and D. L. LaVelle. *Die Castings,* v. 7, Aug. 1949, p. 26-29.

Sometimes results when castings are subjected to elevated temperatures, and is largely caused by air mechanically trapped and compressed when the casting is produced. Influencing factors and pimpling tests.

14D-41. Die-Cast Aluminum Automobile Door Expected To Cut Assembly Costs. *Steel,* v. 125, Aug. 1, 1949, p. 93.

14D-42. Die Cast Aluminum K-F Door. *Modern Metals,* v. 5, Aug. 1949, p. 30.

The largest-area aluminum die casting ever made, an automobile door produced by Doehler-Jarvis Corp. for Kaiser-Frazer Corp. on an experimental basis.

14D-43. Aluminum Die Casting Production Facilitated by New Plant Layout. Roy F. Johnson. *Steel,* v. 126, Aug. 22, 1949, p. 60-63.

How parts for washing and ironing machines are cast, trimmed, machined and handled efficiently.

14D-44. Aircraft Engine Castings. The Foundries of The Bristol Aeroplane Company Ltd. *Metal Industry,* v. 75, July 29, 1949, p. 83-85; Aug. 5, 1949, p. 107-108.

14D-45. Rechnerische Behandlung des Erstarrungsvorgangs beim Duralumin-Tütenguss. (Mathematical Treatment of the Solidification of Quench-Cast Duralumin.) J. Bingel. *Archiv für Metallkunde,* v. 3, May 1949, p. 174-180.

Rates of immersion for different ingot diameters. A diagram shows the furnace and quenching arrangement.

14D-46. Pimpling of Aluminum Die Castings. R. A. Quadt and D. L. LaVelle. *Steel,* v. 125, Sept. 5, 1949, p. 87-88, 120, 122.

Previously abstracted from *Die Castings.* See item 14D-40, 1949.

14D-47. Motor Rotors Can Be Die-Cast. *American Machinist,* v. 93, Sept. 8, 1949, p. 116-117.

How clusters of four rotors for fractional-horsepower motors are die cast in aluminum with less labor, less time, and fewer rejects than for copper-bar rotors. Steel laminations and shafts are used as inserts.

14D-48. Influence des conditions de solidification sur la texture et la répartition des constituants dans les ébauches de fonderie. (Influence of Conditions of Solidification on Crystal Structure and Distribution of Constituents in Rough Castings.) Jean Hérenguel. *Fonderie,* June 1949, p. 1618-1622.

Recommended procedures for light alloys.

14D-49. Die-Casting Without Ejector Pins and Retractable Cores. Arthur Mumper. *Machinery* (American), v. 56, Sept. 1949, p. 195-197.

Die used to cast Al alloy gear covers at the rate of 250 per hr.

14D-50. Aluminium-Alloy Castings. A. R. Martin. *Aircraft Production,* v. 11, Sept. 1949, p. 315-319.

Notable examples of high-strength sand casting, gravity die casting, and evacuated die casting.

14D-51. The Bendix Plaster Technique for Aluminum Castings. H. A. Knight. *Iron Age,* v. 164, Sept. 22, 1949, p. 84-87.

Technique for producing nonferrous castings to close tolerances and unusually high as-cast surface smoothness. The process employs calcium sulfate as a core and investment, mixed under vacuum and injected into an inverted mold under pressure.

14D-52. Some Notable Aluminium-Alloy Castings. A. R. Martin. *Foundry Trade Journal,* v. 87, Sept. 8, 1949, p. 297-305.

See abstract of condensed version from *Engineering,* item 14D-37, 1949.

14D-53. Founding of Beryllium. J. H. Jackson, J. G. Kura, M. C. Udy, and L. W. Eastwood. *U. S. Atomic Energy*

Commission, AECD-2479, July 13, 1948, 24 pages.

Techniques were developed at Battelle Memorial Institute which permit the production of consistently sound beryllium castings from heats up to 80 lb. Recommendations for melting and casting. Includes diagram of the gas atmosphere induction furnace.

14D-54. Some Notable Aluminium-Alloy Castings. A. R. Martin. *Foundry Trade Journal,* v. 87, Sept. 15, 1949, p. 335-342.

High-strength Al alloys do not possess good casting characteristics. How these difficulties have been overcome, leading to the successful production of castings which are able to withstand heavy, fluctuating loads.

14D-55. Preparation and Casting of Beryllium Melts. J. G. Kura, J. H. Jackson, M. C. Udy, and L. W. Eastwood. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 769-778.

Previously abstracted from *U. S. Atomic Energy Commission,* AECD-2479. See item 14D-53, 1949.

14D-56. Grain Size Behavior in Magnesium Casting Alloys. Charles E. Nelson. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 1-23.

Charles Edgar Hoyt annual lecture. The meaning of grain size; the manner in which it is expressed; its importance to serviceability and foundry behavior; the effect of compositional and foundry variables; the most important techniques for grain size control; and the fundamental mechanism of the grain-refining action. Experimental results and conclusions are presented when pertinent to the discussion. 58 ref.

14D-57. Effect of Gating Design on Metal Flow Conditions in the Casting of Magnesium Alloys. H. E. Elliott and J. G. Mezoff. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 223-224; discussion, p. 244-245.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-6. See item 14d-32, 1948.

14D-58. Aluminium Alloy Casting Developments. E. G. West. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A131-A141; discussion, p. A141-A143.

Previously abstracted from *Foundry Trade Journal.* See item 14d-43, 1948.

14D-59. Trends in Aluminum Casting Alloys. Walter Bonsack. *American Foundryman,* v. 16, Oct. 1949, p. 39-45.

Official Exchange Paper of AFS to the French Technical Foundry Assoc. discusses the development of Al casting alloys, their properties, heat treatment, and applications in sand, permanent mold, and die casting.

14D-60. Progress Report on Die-Cast Body Parts. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 35, 78.

The recent disclosure of Al die-cast door frames was intended primarily as a progress report on a continuing research project.

14D-61. Making Special-Duty Castings in Aluminium Alloys. J. Caven and H. W. Keeble. *Foundry Trade Journal,* v. 87, Sept. 29, 1949, p. 401-406; Oct. 6, 1949, p. 421-424, 431.

Details of procedure and equipment for specific large castings.

14D-62. Dégazage des alliages légers fondus à l'aide d'azote sec. (Degasification of Light Alloys by Means of Dry Nitrogen.) Jean Duport. *Fonderie,* Aug. 1949, p. 1709-1711.

Experimental degasification of "Alpax Gamma" (Fe, 0.45%; Si, 9.00%; Cu, 0.03%; Zn, 0.03%; Mg, 0.25%; Mn, 0.03%; Ni, 0.03%; Co, 0.35%; Sn, 0.35%; balance Al) using moisture-free nitrogen. Optimum procedures.

14D-63. Continuous Casting of Aluminium Alloys; Effect on the Physical Properties. J. Herenguel. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 133-139.

Formation of cracks, presence of porosity, and structure of the solidified Al-alloy ingots cast by the semi-continuous process. The effect of continuous casting on wrought-alloy properties, including final appearance and ability to be hot worked.

14D-64. Magnesium Sand Casting. *Magazine of Magnesium,* Nov. 1949, p. 8-11.

Recommended foundry procedures and design considerations. Applications.

14D-65. Die Casting of Light Alloys. F. A. Fox. *Machinery Lloyd* (Overseas Edition), v. 21, Nov. 5, 1949, p. 89-93, 95, 97.

Procedures, equipment, choice of alloys, and applications.

14D-66. La Société de Fonderie d'Aluminium et d'Alliages Légers a créé à Arandon une usine de classe internationale. (Société de Fonderie d'Aluminium et d'Alliages Légers Has Established a Plant of International Importance at Arandon.) Maurice Victor. *Revue de l'Aluminium,* v. 26, July-Aug. 1949, p. 262-270.

Equipment and procedures of new French light-alloy foundry.

14D-67. Use of Hardeners in Producing Aluminum Alloy Castings. James D. Kline. *Foundry,* v. 77, Dec. 1949, p. 79, 222-225.

Various types and their applicabilities. Recommendations.

14D-68. Hot Facts on a Cold Subject. *Die Castings,* v. 7, Dec. 1949, p. 17, 53-54.

Die-cast Al grid with an inexpensive tumbled finish provides the main component of unique new ice-cube drawer. Die-casting method.

14D-69. Efficient Magnesium Castings —Their Design & Production. George H. Found. *Metal Progress,* v. 56, Dec. 1949, p. 833-840, 892.

Endurance, notch sensitivity, and creep of two common Mg casting alloys. Laboratory tests on relatively small specimens correlate closely with stresses existing in full-sized parts at failure. Preliminary designs can be modified so that there may be no portion substantially weaker than the rest. 15 ref.

14D-70. Rough Castings to Finished Piston in Less Than 3 Minutes. Gerald Eldridge Stedman. *Steel,* v. 125, Dec. 19, 1949, p. 78-79, 98.

Aluminum pistons for gasoline engines produced in record time by die casting and machining.

14D-71. Correlation of Cooling Curve Data With Casting Characteristics of Aluminum Alloys. E. E. Stonebrook and W. E. Sicha. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 489-496; discussion, p. 496.

Previously abstracted from preprint. See item 14D-22, 1949.

14D-72. Centrifugal Casting of Aluminum Alloys. J. W. Meier and O. Z. Rylski. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 602-631.

Results of a comparison of various static and centrifugal castings produced in the U. S. and Canada. Foundry equipment and investigations of molding sand, sprues, and gating. 18 ref.

SECTION XV

SCRAP and BYPRODUCT UTILIZATION

15-1. Developing a Waste Disposal Process; Examples From the Copper and Brass Industry. Harding Bliss. *Chemical Engineering Progress.* (Transactions Section), v. 44, Dec. 1948, p. 887-894; discussion, p. 894.

The problem is treated from the general point of view, illustrated by a description of methods developed for recovery of useful products from brass-plant pickle liquors. 35 ref.

15-2. The Scrapmen. *Fortune,* v. 39, Jan. 1949, p. 86-91, 134, 136-139.

Personalities and units of the scrap-metal industry and its mode of operation.

15-3. New Technique for Waste Pickle Liquor Neutralization. Richard D. Hoak and Charles J. Sindlinger. *Industrial and Engineering Chemistry,* v. 41, Jan. 1949, p. 65-70.

Technique whereby substantial reduction in sludge volume is effected, settling is complete in less than an hour, and the vacuum filtration rate is increased markedly. It has been applied to magnesia, high-calcium lime, and dolomitic lime.

15-4. Secondary Aluminum Outlook for 1949. Carl H. Burton. *Metals,* v. 19, Dec. 1948, p. 11-12.

"Conversion deals" are harmful to industry and encourage runaway prices; stresses need of proper segregation of scrap.

15-5. The Treatment of Spent Pickle Liquor. N. Swindin. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 56-69; discussion, p. 69-71.

Theory and practice. 61 ref.

15-6. Control of Liquid and Airborne Wastes from Porcelain Enameling. Hubert S. Kline. *Finish,* v. 6, Jan. 1949, p. 47-49, 52.

The various problems involved.

15-7. Oxygen and Acetylene Gas Distributing System Used Effectively in Large Scrap Preparation Yard. John S. Gray. *Steel,* v. 124, Jan. 10, 1949, p. 60-61.

Procedure at Calumet Iron & Supply Co., East Chicago, Ind.

15-8. Dry Lime Treatment of Waste Pickle Liquor. C. J. Lewis. *Iron Age,* v. 163, Jan. 20, 1949, p. 48-53.

A method of accomplishing disposal, without lagooning. The process employs dry-lime procedures for production of quick-settling sludges which dewater at practical rates on vacuum filters or centrifuges. Lime-slacking or lime-slurrying equipment is not required.

15-9. Scrap Steel Turnings; A Simple Method of Concentration. Edmund R. Thews. *Iron and Steel,* v. 22, Jan. 1949, p. 25-26.

A practical but unscientific method suggested where chipping and baling are uneconomic. The method consists essentially of placing the turnings in a furnace and building a fire under them. The finer material burns supplying heat which melts down the larger pieces, producing material suitable for charging.

15-10. Reclaiming Tin From Residues. A. G. Arend. *Mine & Quarry Engineering,* v. 15, Jan. 1949, p. 23-26.

Procedures and equipment. Flow sheets for reclamation from low and high-grade scrap materials and smelting residues.

15-11. Process Revision Gives Low-Cost Waste Disposal. C. F. Hauck and L. C. Bishop. *Chemical Industries,* v. 64, Jan. 1949, p. 47.

Procedures for disposal of oils, pickle liquors, and cyanide-containing wastes.

15-12. Secondary Metals Now Accepted as of High Quality. Kenneth Rose. *Materials & Methods,* v. 29, Jan. 1949, p. 56-59.

Properties of scrap steel, Al, Cu, Zn, Pb, and Ni as compared with

primary metals. These metals are usually satisfactory for any normal application.

15-13. Aluminium Recovery From Scrap Aircraft. *Engineer,* v. 186, Dec. 31, 1948, p. 684-685.

British techniques. Diagrams of special furnaces for handling contaminated scrap.

15-14. The Treatment of Plating and Pickling Shop Wastes. E. W. Mulcahy. *Journal of the Electrodepositors' Technical Society,* v. 22, 1946-47, p. 227-242; discussion, p. 267-268.

Methods of neutralizing acid from waste liquors and rinse water; precipitation of Cr, Cu, Fe; removal of cyanide in effluents; construction of effluent-treatment tanks of suitable acidproof materials; measurement of flow and pH recording apparatus; removal and scrubbing of nitrous oxide fumes from bright-dipping plants; intake-air velocity on extractors; hard rubber as lining for tanks and fan casings; recovery of waste pickle liquors from industrial pickling plants; plant for crystallization of ferrous sulfate.

15-15. (Book). **The Waste Trades Annual and Directory.** 346 pages. British-Continental Trade Press, Ltd., Suite 1508, 225 W. 34th St., New York City. $5.00.

Information on scrap and waste handling. Lists firms from all countries trading in scrap metals, rubber, paper, and other materials. United Kingdom Waste Materials Regulations are included.

15-16. Secondary Metals Increase in Importance. A. E. St. John. *Journal of Metals,* sec. 1, v. 1, Mar. 1949, p. 8-11.

Trend toward the above as virgin metal supplies become more scarce. Scrap metal collection and utilization procedures in basic nonferrous metals.

15-17. Scrap Metals. Charles White Merrill, Norwood B. Melcher, and A. J. McDermid. *Mining Congress Journal,* v. 35, Feb. 1949, p. 119-121.

Price, production, and consumption trends.

15-18. Treatment of Plating Wastes. E. G. Kominek. *Metal Finishing,* v. 47, Mar. 1949, p. 56-62.

Legal aspects and technical problems.

15-19. Problems in Supplying Scrap for Electric-Furnace Requirements. Stanley M. Kaplan. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 94-96; discussion, p. 100-104.

Physical specification and chemical composition of quality scrap. Education of producers and collectors; maintaining supply and quality; temporary source.

15-20. The Outlook for Scrap. Edwin C. Barringer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 97-100; discussion, p. 100-104.

Ferrous scrap supply prospects from Dec. 1947 point of view.

15-21. Profits in Scrap. James Flett. *Iron Age,* v. 163, Mar. 17, 1949, p. 86-90.

Fundamentals of an intelligent scrap program and examples of methods which have enabled many plants to realize substantial scrap profits. Advantages obtainable by careful segregation.

15-22. Waste Disposal. *Chemical Engineering,* v. 56, Mar. 1949, p. 96-119; 144-147.

Symposium deals with varied problems of air and water pollution, including a section on atomic-waste disposal, and a critical review of the Ohio River Valley Compact for governmental control in an eight-state area.

15-23. Baghouse Operation at the Whiting, Indiana Plant of the Federated Metals Division, American Smelting and Refining Company. Julius J. Donoso. *Smoke Prevention Association of America (Proceedings),* 1948, 10 pages.

Bag-filter equipment and procedures used for recovery of lead-smelter fumes.

15-24. Uber die Verhuttung von Neusilberschrott, -abfällen und -spänen. (Entwicklung eines Verdampfungsverfahrens.) (The Melting of Nickel-Silver Scrap, Waste, and Chips. [Development of an Evaporation Process].) Ernst Justus Kohlmeyer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Jan. 1949, p. 1-6.

Disadvantages of refining by the converter method and the advantages of the evaporation process. The typical form of the constitution diagram of the Cu-Me-O_2 system, in which Me represents any one of a series of alloying metals. Actual evaporation tests with nickel-silver. This method can also be used to separate zinc from bronze, red-brass, and similar scrap materials. 10 ref.

15-25. Two Variants of Electrolytic Cyanide Waste Disposal. 1. Disposal of Waste Cyanides by Electrolytic

Oxidation. R. W. Oyler. **2. Destruction of Cyanide Copper Solutions by Hot Electrolysis.** L. B. Sperry and M. R. Caldwell. *Plating,* v. 36, Apr. 1949, p. 340-347, 412.

Oyler describes a plant process giving details of installation costs. Sperry and Caldwell give results of a laboratory investigation and a plant trial, paying particular attention to the chemistry of the process, and to operating cost. The former employs copper anodes; the latter prefer stainless-steel anodes to carbon-steel anodes and also acid-treat their residues before disposal.

15-26. Recovery of Sulphur From Smelter Gases by the Orkla Process at Rio Tinto. H. R. Potts and E. G. Lawford. *Bulletin of the Institution of Mining and Metallurgy,* No. 509, Apr. 1949, p. 1-36.

Using the process developed in Norway by Lenander, sulfur is recovered as a by-product of copper smelting. Chemical principles, the plant, and plant practice. A brief description of smelting practice. Recovery rarely exceeds 55% and 9.5-11.0% coke must be added to the pyrites. Attemps are being made to improve the yields.

15-27. Modern Slag Processing Plant. *Rock Products,* v. 52, May 1949, p. 63-66, 96.

Extensive use of magnetic separators in plant to remove iron bearing-materials. Fines have many new applications in the manufacture of glass and for soil conditioning.

15-28. Reclamation of Copper From Scrap. W. H. Dennis. *Mine & Quarry Engineering,* v. 15, May 1949, p. 151-154.

Smelting process, including flow diagram.

15-29. Disposal of Plating Room Wastes. I. A Critical Review of the Literature Pertaining to the Disposal of Waste Cyanide Solutions. Barnett F. Dodge and D. C. Reams. *Plating,* v. 36, May 1949, p. 463-469, 512.

References will be published in the concluding installment. (To be continued.)

15-30. Uber die Entfernung von Kupfer-, Messing- und Bronzeuberzugen von Schrott und Abfall. (Removal of Copper, Brass, and Bronze Electroplating From Scrap.) E. T. Richards. *Archiv fur Metallkunde,* v. 2, Oct. 7, 1948, p. 137.

Mechanical, chemical, and galvanic methods.

15-31. Die Verarbeitung von Akkumulatorenruckständen. (Processing Storage Battery Scrap.) E. R. Thews. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 170-172.

Methods of salvaging lead and lead compounds from old storage batteries.

15-32. Technischer Stand und Entwicklungsrichtung der Leichtmetall-Schrottverarbeitung. (Industrial Status and Direction of Development in the Processing of Light-Metal Scrap.) Fritz Währer. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 1, Aug. 1948, p. 129-137.

Includes drawings of equipment and flow diagrams of processes.

15-33. Disposal of Plating Room Wastes. I. A. Critical Review of the Literature Pertaining to the Disposal of Waste Cyanide Solutions. (Continued.) Barnett F. Dodge and D. C. Reams. *Plating,* v. 36, June 1949, p. 571-577, 664.

(To be continued)

15-34. Mechanical Insert Repairs in the Steel Industry. R. L. Rectenwald. *Iron and Steel Engineer,* v. 26, May 1949, p. 76-81; discussion, p. 81.

Method for repair of large castings without disassembly, shrinkage fractures, or warpage.

15-35. Distillation of Zinc from Copper Base Alloys and Galvanizers Drosses. Frank F. Poland. *Journal of Metals,* v. 1, sec. 3, June 1949 *(Metal Transactions,* v. 185), p. 355-359.

Recent applications and improvements in procedure and equipment for recovery of Zn from secondary metals by means of high-temperature electric furnace distillation.

15-36. Cadmium Recovery Practice at the Donora Zinc Works. G. T. Smith and R. C. Moyer, *Journal of Metals,* v. 1, sec. 3, June 1949 *(Metal Transactions,* v. 185), p. 360-363.

Production procedure including raw materials, sulfating, purification, precipitation, briquetting, smelting, remelting, and recovery of rare metals.

15-37. New Facts on the Straightening of Welded Aircraft Structures. A. Y. Brodsky. *Engineers' Digest,* v. 10, May 1949, p. 165-167. Translated and condensed from *Avtogennoe Delo* (Welding), Aug. 1947, p. 14-19.

Previously abstracted from original, item 15-45, 1947.

15-38. Zwanzig Jahre reines Schrottverfahren mit Entwicklung vom Massenstahl zum Edelstahl. (Twenty Years of Pure Scrap Melting With the Development of Ordinary Low-Carbon Steel to High-Grade Steel.) Rudolf Hennecke. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 181-186.

Experiences in the conversion of ferrous scrap to high-grade steel. Methods of refining steel by the

scrap-carbon and slag-reduction processes, and in different types of furnaces.

15-39. Die Verwertung von gekörnten Haldenschlacken bei der Herstellung hydraulischer Bindemittel. (Utilizing Pulverized Waste Slags for the Production of Hydraulic Binders.) Gustav Mussgnug. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 301-306.

As a substitute for cement and similar types of mortar. Recommendations are based on studies of chemical composition, physical condition, strength properties, water of hydration, and grindability.

15-40. Arbeiten der Duisburger Kupferhutte uber die technische Verwendung von Metallamalgamen. (Work With the Duisburg Copper Mill on the Industrial Use of Metal Amalgams.) Oskar Emert. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Feb. 1949, p. 47-55.

Process for extracting Zn as by-product from $ZnCl_2$ solutions in amalgam cells. Special properties of the amalgams (described in detail) make it possible to extract very pure Zn without previous refining of $ZnCl_2$ solution. Other metals, such as Pb and Mn, are obtained by electrolysis or exchange reactions.

15-41. Entwicklung der Aluminiumschrott-Raffination in der Dreischichtenelektrolyse. (Development of the Refinement of Aluminum Scrap by Triple Layer Electrolysis.) Werner Helling and Hans Lay. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Mar. 1949, p. 65-70.

Outlines history and describes and illustrates process in detail.

15-42. Verhalten von Zinn und Antimon beim Altmetall-Bessemern. (Behavior of Tin and Antimony in the Melting of Scrap Metal in the Bessemer Converter.) Wilhelm F. Kaiser. *Zeitschrift fur Erzbergbau und Metallhuttenwesen,* v. 2, Mar. 1949, p. 78-85

Experiments on the bessemerizing of bronze scrap with the object of refining the copper, of salvaging the greatest possible amount of tin, and of reducing the Sb content of the copper to a minimum.

15-43. Verfahren zum Ausschmelzen von zinkhaltigen Ruckstanden der Feuerverzinkungsanlagen. (Method of Recovering by Melting the Zinc in the Waste Products of Hot Galvanizing Plants.) Rolf Haarmann. *Metalloberfläche*, v. 3, Mar. 1949, p. 70-71.

Results.

15-44. Uber "Seigerdörner" aus der Dreischichten - Schmelzfluss - Elektrolyse des Reinst-Aluminiums und ihre Verwendung. ("Liquation Dross" From the Triple-Layer-Melt Electrolysis of High-Purity Aluminum and Its Use.) Hans Wolf. *Metall,* Apr. 1949, p. 116-118.

Five possible uses. 11 ref.

15-45. (Book) **Treatment and Disposal of Industrial Waste Waters.** B. A. Southgate. 327 pages. 1948. His Majesty's Stationery Office, London, England.

Effects of pollution of streams, general methods of treatment available, and special methods devised to solve problems of various industries. Treatment of sewage, coal mining, carbonization, pickling, paper mills, slaughter house, canning, and other industrial wastes.

15-46. (Book) **Metallurgical Working of Metal Scrap and Residues—White Metal Scrap. Vol. I.** (In German.) E. R. Thews. 355 pages. Carl Hanser Verlag, Leonhard-Eck-Strasse 7, 13b Munich 27, Germany. 22.50 DM.

Procurement and salvage of white metal scrap with the aim of promoting new methods and approaches.

15-47. Metallurgical Plant Wastes and Their Treatment. Harry D. Unwin. *Chemical Engineering Progress* (Engineering Section), v. 45, June 1949, p. 351-357; discussion, p. 357-358.

Principles and their application to design of a modern waste treatment and disposal system for the new ball-bearing plant.

15-48. Smog Control Helps Bag More Profits. Norman C. Brundage. *Western Metals,* v. 7, June 1949, p. 21-23.

Collector and its operation; controls smoke and collects enough lead oxide to pay for itself in one year.

15-49. The Disposal of Spent Acid Pickling Liquor. W. B. Wragge. *Journal of the Iron and Steel Institute,* v. 162, June 1949, p. 213-224.

Methods generally used, with emphasis on H_2SO_4 liquors. Neutralizing and crystallizing techniques associated with acid recovery. Operating costs and materials of construction. A ternary equilibrium diagram for the H_2O-$FeSO_4$-H_2SO_4 system. The problem of disposal of ferrous sulfate. 18 ref.

15-50. Plating Waste Disposal. Jerome L. Bleiweis. *Iron Age,* v. 163, June 16, 1949, p. 78-83.

Techniques of treating the various waste solutions, economics involved, and information on a disposal plant.

15-51. Ausweitung der Verwertung von Hochofenschlacke. (Extending the Range of Utility of Blast Furnace Slag.) Heinz Schumacher. *Stahl und Eisen*, v. 69, May 26, 1949, p. 372-378.

Possibilities and methods of producing sinter pumice, roofing slate, concrete articles, refractory brick, and building materials from blast-furnace slag. Automatic installations for the production of refractory brick and roofing slate.

15-52. Disposal of Plating Room Wastes. I. A Critical Review of the Literature Pertaining to the Disposal of Waste Cyanide Solutions. Barnett F. Dodge and D. C. Reams. *Plating*, v. 36, July 1949, p. 723-725, 728-732.

Production of insoluble cyanides, reaction of cyanide with aldehydes, ion exchange, and choice of process. 85 ref.

15-53. Future Sources of Iron Units in Scrap. Charles R. Holton. "Yearbook of the American Iron and Steel Institute, 1948", p. 346-355; discussion, p. 355-367.

Previously abstracted from *Steel*, item 15B-44, 1948.

15-54. Selby Plant Makes Liquid SO_2 From Waste Smelter Gases. *Engineering and Mining Journal*, v. 150, July 1949, p. 138.

Plant of American Smelting and Refining Co.

15-55. Treatment of Plating Mill Wastes. M. U. Priester. *Iron Age*, v. 164, July 14, 1949, p. 105-106.

The wastes consist of rinses from cyanide baths; Cu, Al, and Ni plating and highly alkaline solutions containing substantial amounts of suspended solids, oils, and greases.

15-56. Steel Drum Reconditioning Performed on Specially-Designed Equipment. William J. Miskella. *Steel*, v. 125, Aug. 8, 1949, p. 73-74, 76.

Procedures and equipment which are developed to a high degree of efficiency. Several interesting cleaning, painting, and inspection operations.

15-57. Lower Cost Aluminum Die Castings Possible Through Use of Scrap Metal. James H. Hammett. *Materials & Methods*, v. 30, Aug. 1949, p. 72-74.

Large producer of die castings has made substantial savings without sacrifice in quality by direct use of reclaimed Al scrap.

15-58. The Precious Metals. H. Gordon Dale. *Institution of Mining and Metallurgy*, Preprint No. 5 from symposium, "The Refining of Non-Ferrous Metals", July 1949, 12 pages.

Recovery from various materials which are usually residues and waste products in the precious-metal industries. 37 ref.

15-59. The De-Tinning of Old Cans. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 89-91.

Plant and process. Produces scrap suitable for direct use in steelmaking furnaces, tin, and solder.

15-60. Bergung und Aufarbeitung von Trumermetallen. (Storage and Processing of Scrap Metal.) W. Wiederholt. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, June 1, 1949, p. 267-269.

Specific methods, including methods of removing rust and greases from steel and iron parts and methods of protection against corrosion.

15-61. Die Verarbeitung von Neusilberschrott nach verschiedenen Verfahren. (Different Methods for Processing Nickel-Silver Scrap.) Hans Tzschaschel. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 2, June 1949, p. 161-168; July 1949, p. 212-214.

The importance of dissociating nickel silver into its constituent elements. Critically evaluates the converter and the electrolytic processes of extracting Cu, Ni, and Zn from the scrap. July: the carbonyl process, the vaporization process, and distillation melting.

15-62. Refining Light Metal Scrap; Pre-Treatment — Processes — Furnaces. Adolf Beck. *Metal Industry*, v. 75, Aug. 12, 1949, p. 129-132.

Process for refining Al scrap preparatory to the production of standard alloy compositions. Process may be developed to a stage permitting production of alloys exceeding in purity those which it is possible, at present, to produce from ordinary primary Al of commercial purity.

15-63. Aufarbeitung des Leichtmetallschrotts. (Processing Light-Metal Scrap.) A Beck. *Archiv für Metallkunde*, v. 2, Nov. 15, 1948, p. 181-185.

Several modern methods of melting light metal scrap with special emphasis on Al alloy scrap. Proposed method permits the economical production of high-purity Al, superior to that produced by usual methods.

15-64. How Timken Expedites Steel Mill Scrap Preparation. Frank C. Wier. *Iron Age*, v. 164, Sept. 15, 1949, p. 88-90.

Use of the Linde powder-cutting process.

15-65. Scrap Charging — Key to Increasing Open Hearth Production. R. R. Fayles. *Blast Furnace and Steel Plant*, v. 37, Sept. 1949, p. 1092-1098.

Factors affecting scrap charging,

quality of foreign and home scrap, size of charging box, and scrapyard facilities.

15-66. Cyanide Waste Disposal: Platers Call New Installation "The Model System". Roger Williams, Jr. *Chemical Engineering,* v. 56, Sept. 1949, p. 96-98.

Procedures and equipment used to dispose of cyanide plating wastes. Caustic soda and chlorine are used to convert cyanide to ammonium and potassium carbonates plus NaCl.

15-67. Metal Tube Bases Reclaimed on a Production Basis. R. J. Stanton. *Iron Age,* v. 164, Sept. 29, 1949, p. 70-72.

Reclamation of 3600 usable metal tube bases an hour, with one operation and one high-frequency generator. Ingenious fixturing, plus an extremely short heating cycle, makes profitable the reclaiming of Ni-plated Al and brass tube bases.

15-68. Scrap Metals. Supply and Industrial Applications. H. J. Miller. *Metal Industry,* v. 75, Sept. 16, 1949, p. 223-225; Sept. 23, 1949, p. 251-253.

Difficulties involved in utilizing scrap so that products comply with modern specifications. Supply data are tabulated for Cu, Pb, Zn, and Al-base materials.

15-69. Verarbeitung und Raffination von Leichtmetallschrott. (Processing and Refining Light-Metal Scrap.) Kurt Schneider. *Zeitschrift für Metallkunde,* v. 39, Nov. 1948, p. 342-351; discussion, p. 351.

Methods of removing metallic and nonmetallic impurities from Al. Secondary Al and its alloys are in no way inferior in quality to the primary metal. Laboratory experiments. 31 ref.

15-70. Moderne Methoden zum Einschmelzen und zur Raffination von Leichtmetall. (Modern Methods of Melting and Refining Light-Metal Scrap.) Kurt Schneider. *Metall,* v. 3, Jan. 1949, p. 1-10.

35 references.

15-71. Raffination von Leichtmetallschrott mittels Quecksilber als Scheidemittel. (Refining Light-Metal Scrap With Mercury as Solvent.) Walther Schmidt. *Metall,* v. 3, Jan. 1949, p. 10-13.

The principle of the proposed method is separating the scrap components by dissolving them in Hg, removing the insoluble residue, and then recrystallizing the Al from the solution. The residual Hg increases, then decreases, the resistance of the Al to corrosion.

15-72. Ausgewählte Betrachtungen aus dem Gebiet der Aluminium-Gewinnung nach dem Quecksilber-Verfahren. (Selected Observations in the Field of Aluminum Production by the Mercury Process.) Georg Messner. *Metall,* v. 3, Jan. 1949, p. 14-15.

Types of Al alloys that can be refined by the Hg process, the differential solubilities of the various constituents, and the effect of refining conditions on the product. It was found that the Hg content of refined Al can be reduced to below 0.00001% and that this process is economical in energy consumption.

15-73. Recovery of Sulphur From Smelter Gases by the Orkla Process at Rio Tinto. *Bulletin of the Institution of Mining and Metallurgy,* Oct. 1949, p. 23-28.

Operating data for the process as carried out at present at Thamshavn. Discussion of paper by H. R. Potts and E. G. Lawford.

15-74. Preliminary Planning for Plating Room Waste Disposal. C. Fred Gurnham, Barnett F. Dodge, and D. C. Reams. *Plating,* v. 36, Nov. 1949, p. 1136, 1178.

15-75. Waste Gases. Walter A. Schmidt. *Chemical and Engineering News,* v. 27, Nov. 7, 1949, p. 3272-3276.

Methods and equipment for collection and for recovery of valuable metals from the dust carried by them.

15-76. The Recovery of By-Product Metals in the Smelting of Copper Alloy Scrap; A Survey of Published Information. Marjorie E. Whitaker. *Metallurgia,* v. 40, Oct. 1949, p. 295-304.

15-77. Scrap Preparation. R. F. Fien. *Iron and Steel Engineer,* v. 26, Nov. 1949, p. 86-88; discussion, p. 88.

Efficient and inefficient methods. Recommends that scrap be baled or bundled, and all unprepared heavy scrap cut small enough to give plenty of weight in a buggy. This results in reduced number of buggies per heat and decreased charging time.

15-78. The Waste Pickle Liquor Problem. Wallace G. Imhoff. *Wire and Wire Products,* v. 24, Nov. 1949, p. 1040-1044, 1058-1059; Dec. 1949, p. 1127-1129, 1154-1159.

A review. 272 ref.

15-79. Repairing and Silver Plating Valuable Antiques. Ezra A. Blount. *Products Finishing,* v. 14, Dec. 1949, p. 12-16, 18, 20, 22.

Methods by which silver-plated articles are restored by a combination of mechanical and electroplating methods. Operations include stripping old plate, mechanical repairing, soldering, plating, buffing and burnishing, and lacquering.

15-80. Metallizing Repairs on Hydroelectric Equipment. John E. Wakefield. *Power Generation,* v. 53, Dec. 1949, p. 92, 94, 96.

Use of metallizing in the repair of worn and damaged hydraulic turbines and headgates.

15-81. Methods of Surveying Steel Plant Wastes. A. H. Arbogast. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 80-85; discussion, p. 85-87.

Installations for collection and treatment of the wastes.

SECTION XVI

FURNACES and HEATING DEVICES

16A—General

16A-1. The Fundamentals of Industrial Furnace Design and Operation. Herbert Southern. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 77-92; discussion p. 130-133.

Theory and mathematics.

16A-2. Aerodynamics in Relation to Furnaces. A. H. Leckie. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 112-116; discussion, p. 130-133.

Study of the flow of gases in large furnaces, especially reversing regenerative types.

16A-3. Recuperation in Relation to Furnaces. C. H. Williams. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 122-125; discussion, p. 130-133.

Advantages; possible savings for different types and temperatures.

16A-4. Remarks on Electric Furnaces. A. Glynne Lobley. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 129-130; discussion, p. 130-133.

Ways to achieve greater economy in consumption of energy in use of the above in metallurgical industries.

16A-5. Liquid Fuel for High Temperature Processes. T. C. Bailey, F. J. Battershill, and R. J. Bressey. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 162-174; discussion, p. 182-185.

Data on properties and combustion characteristics, including some for openhearths converted from gas to oil.

16A-6. Le probleme des creusets du four a haute fréquence. (The Problem of Crucibles for High-Frequency Furnaces.) F. M. Bosch and H. Haemers. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 312-316.

Factors involved in the above such as composition of material, design, wall thickness, etc. Optimum physical and chemical properties of the material, as well as its method of production.

16A-7. Kernprobleme des Energieumsatzes am grossen elektrischen Schmelzofen. (Basic Problems of Energy Exchange in Large Electric Melting Furnaces.) J. Wotschke. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 14, Oct. 1948, p. 299-306.

Shows that the center of energy exchange is concentrated in certain zones of "power flow". A large melting furnace is used to explain the method of determining its position and magnitude.

16A-8. Heat Application; Needs in Furnace Development and Fuel Utilization for the Metal Industry. F. E. Harris. *Iron and Steel,* v. 21, Dec. 1948, p. 629-632. Based on article in *Industrial Heating.*

16A-9. Air Circuit for Furnace Control. W. J. Schupner. *Applied Hydraulics,* v. 1, Jan. 1949, p. 25, 27.

Use of compressed air to operate conveyor furnace for annealing.

16A-10. Utilisation de l'énergie solaire. (Utilization of Solar Energy.) Félix Trombe, Marc Foex, and Charlotte Henry la Blanchetais. *Journal des Recherches du Centre National de la Recherche Scientifique,* Nos. 4-5, 1948, p. 61-89.

Variation in available solar energy for different locations in France and elsewhere throughout the year. French experimental furnace capable of producing temperatures above 5000° C., experiments in which metals and refractory oxides were melted. 12 ref.

16A-11. Progres et développements de la méthode de détermination des flux de chaleur sur modele électrique. (Progress and Development of a Method for Determination of Heat

Flow by Electrical Models.) E. Bonnier. *Verres et Réfractaires,* v. 2, Oct. 1948, p. 288-292.

The experimental method proposed by Beuken and its present state of development. Theoretical bases and new applications. 17 ref.

16A-12. Protective Atmospheres in Industry. Part II. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 51, Dec. 1948, p. 41-48.

Theoretical considerations involving chemical reactions occurring in the principal types of gases commonly used as furnace atmospheres. (To be continued.)

16A-13. (Book). **Fuel and the Future. Vols. I, II, and III,** 370, 374, and 211 pages. 1948. H. M. Stationery Office, London, England.

Proceedings of a conference held in London, Oct. 8-10, 1946. The papers and accompanying discussion deal with both research and practical procedures, with emphasis on fuel savings. Among the topics dealt with are: generation of steam (locomotives, boilers, stokers, etc.); steam utilization in various industries; heat for drying in industry and agriculture; factory heating and air conditioning; high-temperature processes (metallurgical and ceramic firing; the gas producer); carbonization and the coke, gas, and chemical industries; coal cleaning, sizing, and grading; and domestic heating (architectural design, insulation, heating appliances, and district heating).

16A-14. Calculation of the Electrical Resistance of the Channel of an Induction Furnace With an Iron Core. (In Russian.) P. F. Sabaneev. *Promyshlennaya Energetika* (Industrial Power), v. 5, Oct. 1948, p. 8-10.

A newly developed formula. Methods of application and calculation are illustrated by two sample determinations.

16A-15. Safe Operating Procedures for Different Types of Special Atmospheric Furnaces. C. George Segeler. *Industrial Heating,* v. 16, Jan. 1949, p. 58, 60, 62, 64.

Special furnace atmospheres, both combustible and non-combustible types; instrumentation; starting, operating, and shutting-down procedures; toxic-gas hazards.

16A-16. Protective Atmospheres in Industry. Part III. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, Feb. 1949, p. 37-44.

Atmospheres for preventing oxidation or reducing oxides, with emphasis on uses and properties, costs, and methods of manufacture and distribution. (To be continued.)

16A-17. (Book). **Le Chauffage Haute Frequence.** (High-Frequency Heating.) G. Henry-Bezy. 130 pages. Dunod, 92, Rue Bonaparte, Paris 6, France.

One section deals with dielectric heating (heating of nonconductors); and the other with induction heating (heating of conductors). Numerous applications; advantages over other heating methods. Use of radio frequencies.

16A-18. Improved Annealing Furnace Operation by Use of Tempered Flame Burners. A. A. Fennell. *Industrial Heating,* v. 16, Feb. 1949, p. 240, 242, 244, 246, 248-250.

Car-type annealing furnace is equipped with special burners arranged to fire over and under the load, without flame impingement. A special design of burner is used which gives a luminous flame with 100% excess air. Nozzle prevents blowout even with 600% excess air.

16A-19. How Induction Heating Can Help Save Cold Cash. *Modern Industry,* v. 17, Feb. 15, 1949, p. 109-110.

16A-20. Economics of Radio Frequency Heating. A. P. Bock. *Industrial Heating,* v. 16, Feb. 1949, p. 230, 232, 234, 236, 238, 323-324; *Steel,* v. 124, Feb. 21, 1949, p. 94-97.

Graphs aid in calculating the above for specific jobs.

16A-21. Radiant Heat Drying of Industrial Paints. K. A. Lohausen. *Electroplating and Metal Finishing,* v. 2, Feb. 1949, p. 107-115. Translated from *Metalloberfläche,* v. 2, No. 12, 1948, p. 257-261.

Mechanism of radiant-heat drying and equipment. The influence of the paint, the base to which the paint is applied, and the type and intensity of radiation.

16A-22. Furnace Atmospheres—Their Generation and Use. William F. Barstow. *Steel Processing,* v. 35, Feb. 1949, p. 91-94, 96-97.

Various types of equipment and applications.

16A-23. Notes on Industrial Furnace Design. A. H. Holden. *Gas Times,* v. 58, Feb. 11, 1949, p. 170-173.

16A-24. How to Select Induction Heating Equipment. Frank T. Chesnut. *Steel,* v. 124, Mar. 21, 1949, p. 109-112, 116.

Recommendations for selection among the five distinct sources of current supply available.

16A-25. The Manifold Problem. J. D. Keller. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American*

Society of Mechanical Engineers, v. 71), Mar. 1949, p. 77-85.

The general problem of manifolds supplying fluids to a set of parallel pipes or ducts, or discharging through numerous openings along the manifold length. "Pipe burners" for gaseous fuels; the manifold of the "radiant-fire" type of gas burner; distributing flues above and below the checkers of openhearth furnaces; furnace combustion chambers containing heat ports; and many others.

16A-26. Fours électriques a haute fréquence de fusion et coulée en lingotiere sous vide. (High Frequency Electric Furnace for Melting and Casting in Vacuum.) *Journal du Four Electrique et des Industries Electrochimiques,* v. 57, Nov.-Dec. 1948, p. 123-126.

Principles of such furnaces and sphere of application.

16A-27. Heat Transfer to Liquid Metals Flowing in Asymmetrically Heated Channels. W. B. Harrison and J. R. Menke. *American Society of Mechanical Engineers,* Paper No. 48-A-51, 1948, 14 pages.

Heat transfer to a fluid in turbulent flow between two plane parallel walls is discussed for the case of a system in which the entire heat flux is transferred at one of the walls. Experiments which might yield information on variation of eddy diffusivity near the center line of a channel; a method for predicting heat-transfer coefficients for asymmetrical heat-transfer systems.

16A-28. Verfahren zur Bestimmung der Gesamtstrahlung von Kohlensäure und Wasserdampf in technischen Feuerungen. (Method of Determining the Total Radiation of Carbon Dioxide and Water Vapor in Industrial Furnaces.) C. A. Landfermann. *Stahl und Eisen,* v. 69, Feb. 3, 1949, p. 98-99.

Empirical method of determining the above fails to account for the physical processes of radiation. Explains briefly the physical laws of gas radiation and evolves, on the basis of physical constants, an equation for calculating the radiation of a mixture of CO_2 and H_2O vapor.

16A-29. The Design and Some Construction Details of Two Laboratory Vacuum Furnaces for Casting Metals. Eugene D. Selmanoff. *U. S. Atomic Energy Commission,* MDDC-1126; LADC-279, June 29, 1946, 13 pages.

The first has a tungsten or molybdenum resistance winding. The second uses high-frequency heating, but may be adapted for resistance heating. Both employ bottom-pouring technique. 21 ref.

16A-30. Graphite Resistor Furnace Melting Practice. B. N. Ames and N. A. Kahn. *American Foundrymen's Society,* Preprint No. 52, 1949, 5 pages.

A two-phase furnace utilized in foundries aboard Naval repair ships and in the New York Naval Shipyard foundry. Basic elements of design and operating characteristics and data on the utilization of zircon refractories. Power consumed per ton of metal melted, melting times for consecutive heats of monel, steel and valve bronze, normal furnace atmospheres generated, and results obtained in the manufacture of pressure castings of monel and valve bronze.

16A-31. A Look at Induction Heating. W. E. Benninghoff. *Steel Processing,* v. 35, Mar. 1949, p. 133-136.

Equipment, procedures, applications.

16A-32. Protective Atmospheres in Industry. Part IV. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, Mar. 1949, p. 25-30.

Combusted fuel gas—its uses and properties, costs, manufacture, and distribution. Methods and equipment used in the purification of gases. (To be continued.)

16A-33. Some Simplified Heat Transfer Data. Margaret Fishenden and O. A. Saunders. "Waste-Heat Recovery From Industrial Furnaces," 1948, p. 38-66.

Some of the basic data. Actual heat transfer coefficients, which can be read off directly from curves, have been worked out for some of the most important cases. "Similarity" methods of correlation upon which they are largely based.

16A-34. An Experimental Determination of the Factors Governing the Design of Regenerators With Special Reference to Coke Ovens. T. C. Finlayson and A. Taylor. "Waste-Heat Recovery From Industrial Furnaces," 1948, p. 67-117.

Description and diagrams of full-sized experimental plant, including use of a plastic model to check gas distribution. 15 ref.

16A-35. Tubular Metallic Recuperators. G. N. Critchley and H. R. Fehling. "Waste-Heat Recovery From Industrial Furnaces," 1948, p. 118-164.

Waste-gas heat content, technical and economic possibilities for its recovery, optimum recuperator design, and selection of recuperator materials. 37 ref.

16A-36. Waste-Heat Recovery in the Metallurgical Industry. J. A. Kilby, W. G. Cameron, E. C. Evans, A. H.

Leckie, J. L. Harvey, and A. E. Balfour. "Waste-Heat Recovery From Industrial Furnaces," 1948, p. 242-337.

Results of a comprehensive study of methods, equipment, and economics for the wide variety of furnace, boiler, and oven equipment used. 25 ref.

16A-37. Induction Does Some Odd Jobs. Frank W. Curtis. *American Machinist,* v. 93, Apr. 21, 1949, p. 81-83.

Variety of unusual operations including drying, bonding, debonding, and sealing handled by induction heating.

16A-38. Furnace Atmospheres—Their Generation and Use. William F. Barstow. *Industrial Heating,* v. 16, Apr. 1949, p. 614, 616, 618, 620, 622, 624, 699.

Development of controlled atmospheres, the chemical elements which must be considered in furnace atmospheres, their compounds and reactions. Five basic groups of atmosphere gas generators, their more outstanding characteristics, the types of atmospheres each generates, and the uses to which they are suited.

16A-39. Crucible Completes $3,200,000 Program at Spaulding Works. *Industrial Heating,* v. 16, Apr. 1949, p. 635-636, 638, 640, 642, 700, 702, 704.

Miscellaneous new furnace equipment which produces a wide range of cold-rolled alloy, stainless, and high-carbon-steel specialties, and the center of Crucible's special products manufacturing and development activities for the production of magnets, precision castings, cast alloy steels, and alloy welding rods.

16A-40. Rotary Heat Treating Method Reduces Floor Space Requirements and Provides Greater Operating Flexibility. Walter H. Holcroft and Edward C. Bayer. *Steel,* v. 124, May 2, 1949, p. 87-88, 137.

A controlled-atmosphere rotary heat treating furnace in operation in automotive plants. Furnace is suitable for carbonitriding, clean hardening, and deep case carburizing of small and medium-sized parts at temperatures up to 1700° F. Quench and wash are included.

16A-41. Un nouveau four électrique. Le four triphasé a arcs indirects Pechiney-Cartoux. (A New Electric Furnace. Three-Phase Furnace With Indirect Arc of the Pechiney-Cartoux Type.) Henri Cartoux. *Journal du Four Electrique et des Industries Electrochimiques,* v. 58, Jan.-Feb. 1949, p. 13-15.

Furnace has automatic control permitting easy operation with minimum man-hours and power involved. Such furnaces, designed for capacities between 600 kg. and 10 ton, are particularly adaptable for treatment of copper alloys, special and carbon steels, and different kinds of cast steels and irons. Construction details. (To be continued.)

16A-42. (Book.) **Waste-Heat Recovery From Industrial Furnaces.** 384 pages. 1948. Chapman & Hall, Ltd., 37 Essex Street, W.C. 2, London, England.

Introduction; eight papers based on a series presented at a recent Institute of Fuel Symposium; and a tabulation of heat-transfer data. Individual papers of direct metallurgical interest are abstracted separately.

16A-43. Development in Electric Heating for Industrial Purposes. W. S. Gifford. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 193-228; discussion, p. 229-230.

British equipment and procedures.

16A-44. Elkem Rotating Hearth Furnace for Electrothermic Processes. Tonnes Ellefsen. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 308-330; discussion, p. 347-366.

Purpose is to avoid formation of melting craters around the electrodes, which cause heavy losses. Other advantages. Formation of craters in stationary furnaces, development of the rotating furnace, typical installations, formulas for maximum speed of rotation, economy, installation costs, and advantages of the rotating furnace.

16A-45. Outline of Electric Furnace Development. F. Thomlinson. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 231-242; discussion, p. 347-366.

With special reference to the various metallurgical applications.

16A-46. Perspectives du chauffage par induction dans la grosse industrie. (Prospects for Induction Heating in Heavy Industry.) A. R. Baffrey. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 379-387; discussion, p. 414-444.

Deals with above especially as applied to melting, refining, forging, tube butt-welding, and surface-hardening furnaces.

16A-47. High Frequency Heating in Industry. H. J. Meerkamp Van Embden, H. Van Suchtelen, and E. C. Witsenburg. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 394-407; discussion, p. 414-444.

Principles of inductive and capacitive heating and the chief applications.

16A-48. Production Induction Heating. W. E. Benninghoff. *Industrial Heating,* v. 16, May 1949, p. 792, 794, 796, 798, 800, 802, 804, 822.

Theory, procedures, equipment, advantages, and applications.

16A-49. Industrial Applications of Radiant and High Frequency Heating. D. E. Hayward. *Journal of the Imperial College Chemical Engineering Society,* v. 1, 1945, p. 50-53.

16A-50. Wämewirtschaft beim Gluhen und Härten. (Heat Economy in Annealing and Hardening Operations.) Egon Neuhäuser. *Stahl und Eisen,* v. 66-67, Oct. 9, 1947, p. 351-355.

A thorough analysis of the utilization of fuel in operation of heat treating furnaces. How large savings can be made by more efficient methods and equipment.

16A-51. Elektrisch beheizte Formguss-Kokillen. (Electrically Heated Ingot Molds.) F. Goederitz. *Archiv fur Metallkunde,* v. 2, Mar. 1948. p. 82-86.

Advantages and disadvantages. Arrangement used for an experimental mold of this type. Compares heat consumption and operation with gas-heated ingot molds. Practical experiments, and analysis of results.

16A-52. Eine Näherungslösung der Wärmeleitungsgleichung mit Anwendungen in der Wärmetechnik. (An Approximate Solution of the Equation of Heat Conduction and Its Technological Application.) J. Bingel. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 106-107.

A theoretical, mathematical analysis.

16A-53. Some Applications of the High Frequency Induction Heating Process. J. C. Howard. *Metallurgia,* v. 40, May 1949, p. 37-43.

Principles involved, equipment used, and typical applications to heat treating, forging, brazing, and soldering.

16A-54. Some Recent Heat Treatment Furnace Installations; Progress in Design and Application. *Metallurgia,* v. 40, May 1949, p. 44-53.

16A-55. Heating Metal Slabs; Modern Walking-Beam Mill Furnace. M. van Marle. *Metal Industry,* v. 74, May 20, 1949, p. 403-404.

British installation.

16A-56. Water Cooled Cupolas. *Iron Age,* v. 163, June 9, 1949, p. 61.

New British development reported by W. H. Bamford in which water tanks are used in place of refractories for melting zones.

16A-57. Badanie wspolczynnika palnika "k" oraz przeplywu ciepla w piecach plomiennych. (Investigation of Burner Coefficient "k" and Heat Flow in a Fuel-Fired Furnace.) R. Dawidowski and T. Senkara. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 59-72.

Above coefficient was determined experimentally in presence of 23% excess air. Distribution of temperature of the waste gases and total coefficient of heat transmission to the cold charge. Special "calorimetric sounding rod" used. Part played by convection radiation from the walls.

16A-58. (Book) **Transactions of the Second International Congress on Electroheat and Electrochemistry. (Compte-Rendu du Deuxieme Congres International sur l'Electrothermie et l'Electrochimie.)** 503 pages. 1947. Nederlands Institut voor Electrowarmte en Electrochemie, Arnhem, Netherlands.

Held in The Hague, Sept. 3-4, 1947. Headings are in both English and French, also abstracts of the papers are in English, French, or German. Technical papers are divided into the following groups: general; low-temperature heating; industrial resistance furnaces; induction and high-frequency heating; measuring and regulating; and electrochemistry. Papers of metallurgical interest are abstracted separately.

16A-59. The Measurement of Heat Input Into a Furnace. *Journal of the Society of Glass Technology,* v. 33 (Transactions Section), Feb. 1949, p. 19-26.

Methods for measurement of flow of clean gas; of hot, raw producer gas; and of liquid fuels. Methods for calorific-value determination.

16A-60. Induction Heating; The Principles, Equipment and Technical Considerations. *Automobile Engineer,* v. 39, June 1949, p. 239-242. Based on paper by H. B. Osborn, Jr.

16A-61. Large Modern Industrial Gas Fired Processes Tailored to Fit the

Job. James Kniveton. *Industrial Gas,* v. 27, June 1949, p. 10, 23-24.

Furnaces and applications to various metals.

16A-62. Design and Performance of Modern Large Rotary Furnaces. A. F. Kritscher. *Industrial Heating,* v. 16, June 1949, p. 984, 986, 988. A condensation.

In cooperation with three large companies, a series of tests was run to determine the relationship of furnace to steel temperatures, inside to outside steel temperatures, and corresponding hearth, roof, and side-wall temperatures. Design and temperature control, and recommendations for optimum operation under varying plant conditions.

16A-63. Fundamental Data for Induction and Dielectric Heating. Part I. Applications and Selection of Equipment. *Industrial Heating,* v. 16, June 1949, p. 990-992, 994.

16A-64. Electric Heaters in Recirculating Type Industrial Ovens. R. J. Ruff. *Industrial Heating,* v. 16, June 1949, p. 1047-1048, 1050, 1052, 1054, 1062.

Evolution of the uniform heating of electrically heated ovens by recirculation of preheated air; factors influencing the present practice of determining volume and velocity of recirculated air; structural qualifications required of resistance-type oven-air heaters; and placement of heaters within the oven system.

16A-65. Construction and Testing of Surface-Combustion Furnaces. Leo Brewer and George H. West. *U. S. Atomic Energy Commission,* MDDC-550, Dec. 17, 1946, 5 pages.

Two of the above furnaces for sintering of oxide crucibles were constructed and used up to 2000° C. with propane as fuel. MgO and ZrO_2 were found to be satisfactory construction materials.

16A-66. Utilization of Secondary Energy Resources in the Metal Industry. (In Russian.) E. A. Nitskevich. *Promyshlennaya Energetika* (Industrial Power), v. 6, Mar. 1949, p. 7-11.

Comprehensive study of the present status of utilization of secondary-energy resources in ferrous and nonferrous metallurgy in the USSR. Basic problems involved in utilization of such energy. Means of improving utilization and limits of practicality.

16A-67. Fundamental Data for Induction and Dielectric Heating. Part II. *Industrial Heating,* v. 16, July 1949, p. 1188, 1190, 1192, 1194.

Basic formulas involved in the calculation of various quantities connected with radio-frequency and induction-heating problems. Physical constants of metals commonly used in calculations relating to induction heating.

16A-68. Vaporized Oil as a Standby Fuel on a Gas-Fired Mold Drying Oven. J. E. Klika. *Industrial Heating,* v. 16, July 1949, p. 1246, 1248-1250.

Equipment for use.

16A-69. Modern Core Ovens. Charles H. Barnett. *Industrial Gas,* v. 28, July 1949, p. 16-17, 25-26.

16A-70. Heating Systems for Stoving Ovens. 1. The Case for Gas. *Electroplating and Metal Finishing,* v. 2, July 1949, p. 449-465.

Gas as fuel. Matters affecting choice of convector or radiant heating systems to suit requirements.

16A-71. High Speed Heating Machines. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 29.

Use of induction heating for three different jobs in different plants—scale removal, surface hardening, and soldering.

16A-72. Theory of Calculation of the Radiation of Furnace Elements. (In Russian.) *Kotloturbostroenie* (Boiler and Turbine Manufacture), Mar.-Apr. 1949, p. 1-4.

Critically analyzes, on the basis of theoretical and experimental investigation, two formulas for the above, one proposed by Timofeev and the other by Gurvich. Data of investigation indicate that the latter formula, based on the theory similarity, is verified by most existing experimental data and indicates correctly the character of dependence of gas temperature on basic parameters of combustion.

16A-73. (Book) Induction Heating. N. R. Stansel. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. $3.50.

A technical discussion of electrical and thermal principles of the above use of eddy currents for heating service. Complete details and illustrations are given on coil design for surface hardening and for melting metals. Installation of power-circuit conductors. Electrical resistivities of metals and alloys, and the resistance ratios of round and square copper conductor tubes.

16A-74. Design and Performance of Modern Large Rotary Furnaces. A. F. Kritscher. *Industrial Gas,* v. 28, Aug. 1949, p. 7, 24-26.

Previously abstracted from *Industrial Heating,* item 16A-62, 1949.

16A-75. Wax Eliminating and Flask Temperature Control Furnace. Charles T. Dierker. *Industrial Gas,* v. 28, Aug. 1949, p. 8, 27.

Furnace used in the production of precision castings by the lost-wax investment process.

16A-76. The Fields of Use for Prepared Atmospheres. W. A. Darrah. *Industrial Gas,* v. 28, Aug. 1949, p. 9-12, 20-24.

Metallurgical and other uses.

16A-77. Protective Atmospheres in Industry. Part IX. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, Aug. 1949, p. 26-29.

Some of the typical instruments used in the controlling and measuring of various industrial gases, and the general principles upon which their operation is based. (To be continued.)

16A-78. Heat Radiation Development. Jay DeEulis. *Steel,* v. 125, Aug. 29, 1949, p. 84, 86.

New 180° oval-shaped radiant tube. Installation steps up furnace efficiency and cuts fuel costs.

16A-79. Large, Modern Industrial Gas-Fired Processes Tailored to Fit the Job. James Kniveton. *Industrial Heating,* v. 16, Aug. 1949, p. 1342-1344, 1346, 1348, 1350, 1352, 1480.

A number of facts developed through research and production installations are said to make textbook formulas obsolete. Installations for heating automotive connecting-rod blanks, end heating of bars, reheating of seamless tube, and brazing aluminum drier assemblies for refrigerators.

16A-80. Fundamental Data for Induction and Dielectric Heating. (Concluded.) Part III. Dielectric-Heating Formulae. *Industrial Heating,* v. 16, Aug. 1949, p. 1374, 1376.

16A-81. Production of Metallurgical Coke. M. D. Edington. *Foundry Trade Journal,* v. 87, Aug. 4, 1949, p. 149-153.

The relationship of modern trends to cupola practice based on British conditions with respect to coal reserves and properties of British coals.

16A-82. Der Soll-Verbrauch von Kleinschmiedeöfen. (The Calculated Fuel Consumption of Small Forging Furnaces.) Paul-Otto Veh. *Stahl und Eisen,* v. 69, July 21, 1949, p. 514-519.

65 forging furnaces of different designs and sizes were studied to determine the relationship between heat consumption and interior-surface area. A method of compiling theoretical consumption curves of gas-heated forging furnaces.

16A-83. How Much Does It Cost to Use Radio Frequency Heating? A. P. Bock. *Machine and Tool Blue Book,* v. 45, Sept. 1949, p. 71-74, 76, 78-80, 82, 84.

See abstract from *Industrial Heating* and *Steel,* item 16A-20, 1949.

16A-84. Gas Fired Annealing Furnace Handles Railroad Tank Cars. *Iron Age,* v. 164, Sept. 8, 1949, p. 85-86.

A furnace 52 ft. long, 19 ft. wide and 21 ft. high, for annealing or stress-relieving welded railroad-car tanks and other vessels. Burner capacity is sufficient to bring the furnace, plus a 75-ton charge, to 1600° F. in 3 hr. Wall and arch design, burner arrangement, and controls.

16A-85. The Use of Oxygen in the Ferrous and Non-Ferrous Metallurgical Industries. J. O. Brandt. *Journal of the Society of Glass Technology,* (Transactions Section), v. 33, Apr. 1949, p. 103-119.

The openhearth steel-melting furnace is compared with the glass-tank furnace. Use of oxygen as a means of enhancing flame temperature in the openhearth, both from a theoretical and practical standpoint; details of the various procedures. The maximum permissible roof temperature is probably the most important factor limiting the widespread use of oxygen in nonferrous process furnaces and glass tanks.

16A-86. La transmission de la chaleur dans les fours métallurgiques. (Heat Transfer in Metallurgical Furnaces.) C. Hulse and R. J. Sarjant. *Revue de Métallurgie,* v. 46, May 1949, p. 297-308.

Existing methods for calculation of the above, and several new graphical methods. Analysis of heat transfer using these methods indicates the importance of uniform heating, which may reduce considerably the time necessary for a given process.

16A-87. Classification of Properties of Combustible Substances Characterizing Their Behavior in the Blast-Furnace Process. (In Russian.) K. I. Syskov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Apr. 1949, p. 514-518.

Properties are tabulated according to their proposed classification, indicating individual influence on the blast-furnace process.

16A-88. High Speed Gas Heating. Part I. S. L. Case. *Steel Processing,* v. 35, Aug. 1949, p. 425-428.

Design of ceramic burners—superheat slot-type, radiant-cup, and those used to impinge heat directly on the part. Technology of this type of gas heating. Heating of tubular

shapes for hot forming operations. (To be continued.)

16A-89. Heat and Pressure Distribution Inside Industrial Furnaces. J. Henri Brunklaus. *Industrial Gas,* v. 28, Sept. 1949, p. 16-18, 23-26.

Mainly applicable to atmospheric gas burners widely used in Europe.

16A-90. High Frequency Induction Heating. E. May. *Transactions of the Institution of Engineers & Shipbuilders in Scotland,* v. 92, Aug. 1949, p. 488-505; discussion, p. 505-512.

Survey of industrial high-frequency power sources, induction heating, induction melting, induction through-heating for forging, surface hardening by induction, and soldering and brazing with induction heating.

16A-91. The Application of Underfeed Stokers to Foundry Stoves. E. L. Tinley. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 1-10; discussion, 26-32.

Application to core and mold drying. Advantages and other applications.

16A-92. The Application of the Semi-Producer Furnace to Foundry Stoves. A. C. Hutt. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 11-15; discussion, 26-32.

The furnace and its operation for core drying. Labor saving and better temperature control.

16A-93. The Application of the Down-jet Furnace to Foundry Stoves. G. C. H. Sharpe. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 17-25; discussion, 26-32.

Experimental work on the furnace and mold-drying stove.

16A-94. Water Cooled Cupolas. W. H. Bamford. *British Cast Iron Research Association Journal of Research and Development,* v. 3, Aug. 1949, p. 41-48.

Previously abstracted from *Iron Age.* See item 16A-56, 1949.

16A-95. Electric Furnaces in the Metal Industries. G. Reginald Bashforth. *Metallurgia,* v. 40, Sept. 1949, p. 249-254.

Various types of arc furnaces; reference is made to the electric reduction furnace.

16A-96. Heat Transfer to Liquid Metals Flowing in Asymmetrically Heated Channels. W. B. Harrison and J. R. Menke. *Transactions of the American Society of Mechanical Engineers,* v. 71, Oct. 1949, p. 797-802; discussion, p. 802-803.

Previously abstracted from *American Society of Mechanical Engineers,* Paper No. 48-A-51, 1948. See item 16A-27, 1949.

16A-97. Controlled Atmospheres for Metals. L. F. Spencer. *Materials & Methods,* v. 30, Oct. 1949, p. 83-92.

One of a series of comprehensive articles on engineering materials and their processing. 14 ref.

16A-98. Improved RF Induction Heating Cuts Processing Costs. Herman C. Dustman. *Steel,* v. 125, Oct. 17, 1949, p. 72-75.

Significant advancements in equipment design, resulting in more effective use of high-frequency induction heating on such jobs as through heating for forging, annealing for forming and drawing operations, and selective hardening.

16A-99. Die Grundlagen der Anwendung der Elektrowärme in der metallverarbeitenden Industrie. (The Principles of the Application of Electric Heat in the Metal-Working Industry.) Fr. Knoops. *Metall,* v. 3, Mar. 1949, p. 76-80.

16A-100. Automatic Combustion and Temperature Control on Modern Oil-Fired Furnaces. G. J. Jonas. *Industrial Heating,* v. 16, Oct. 1949, p. 1758, 1760.

16A-101. Induction Brazing and Hardening. Fred M. Burt. *Welding Engineer,* v. 34, Nov. 1949, p. 17-19, 22.

Seven different units of the motor-generator, spark-gap, and electronic-oscillator types used for varied customer-service applications.

16A-102. Dry Coke Cooling. G. E. Foxwell. *Journal of the Institute of Fuel,* v. 22, Oct. 1949, p. 346-353.

Process of quenching coke without use of steam, in order to improve the efficiency of heat utilization. Quality of coke and its suitability for blast-furnace practice. Economics.

16A-103. Heat Loss Through a Solid Floor. H. H. Macey. *Journal of the Institute of Fuel,* v. 22, Oct. 1949, p. 369-371.

Estimation of heat loss through a floor standing solid on the ground and surrounded by a wall, as in kilns, furnaces, and driers.

16A-104. High Speed Gas Heating. Parts II and III. S. L. Case. *Steel Processing,* v. 35, Sept. 1949, p. 497-500; Oct. 1949, p. 545-548.

Part II: Heating of tubular shapes for hot forming operations; continuous heating of bars for annealing or through hardening; applying high-speed gas heating to surface-hardening problems. Part III: Through hardening and tempering; application of high-speed gas heating to brazing problems; induction and high-speed gas heating; surface

hardening of steel. (To be concluded.)

16A-105. Electric Furnaces in the Metal Industries. (Concluded.) G. Reginald Bashforth. *Metallurgia*, v. 40, Oct. 1949, p. 304-307.

Various types of low and high-frequency induction furnaces. The electric resistance furnace as used for heat treatment.

16A-106. The Use of Oxygen in the Ferrous and Non-Ferrous Metallurgical Industries. Part II. D. J. O. Brandt. *Journal of the Society of Glass Technology* (Transactions Section), v. 33, June 1949, p. 176-187.

Use of oxygen primarily as an oxidizing agent in openhearth, reverberatory and electric furnaces, converters, and blast furnaces.

16A-107. Gas Permeability of Refractory Linings in Coke Ovens. (In Russian.) B. I. Kustov. *Ogneupory* (Refractories), v. 14, June 1949, p. 256-259.

Loss of gas due to diffusion through the refractory lining and to escape through joints in the lining. Methods of calculating coefficient of permeability and of applying it to calculation of losses. 16 ref.

16A-108. Production Economies Realized by Proper Use of Induction Heating. J. A. Evans. *Materials & Methods*, v. 30, Nov. 1949, p. 57-60.

Case histories demonstrate the versatility of induction heating and how its carefully planned use results in better and lower-cost heat treating and brazing.

16A-109. Non-Extinguishable Pilot Light for Combustion Processes. Walter G. Thompson. *Chemical Engineering*, v. 56, Nov. 1949, p. 131.

Burning takes place within a porous ceramic body. Value for high-velocity processes, including jet propulsion and blast furnaces.

16A-110. Graphite Resistor Furnace Melting Practice. *Industrial Heating*, v. 16, Nov. 1949, p. 1978, 1980. Condensed from paper by B. N. Ames and N. A. Kahn.

Previously abstracted from *American Foundrymen's Society*, Preprint No. 52. See item 16A-30, 1949.

16A-111. High Speed Gas Heating. (Concluded.) S. L. Case. *Steel Processing*, v. 35, Nov. 1949, p. 603-605.

Economic advantages as compared with conventional furnace methods of heating metals for forging. Economics also favor gas heating over induction heating. Use for brazing.

16A-112. Mullite and Zircon Furnace Tubes for High Temperature and High Vacuum Systems; New Method for Measuring Pressure. Earl A. Gulbransen and Kenneth F. Andrew. *Industrial and Engineering Chemistry*, v. 41, Dec. 1949, p. 2762-2767.

Design, construction, and testing of refractory porcelain furnace units of double-walled construction which can be sealed direct to a Pyrex glass vacuum system. Pressures of 10^{-6} mm. Hg or better can be obtained with these units at 1175° C. A new method for measuring performance of a furnace tube by measurement of rate of reaction of Zr with gases in the tube. 11 ref.

16A-113. The Principle of Recirculation of Gases as Applied to Mould and Core Drying Stoves. E. Watkinson. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 67-82; discussion, p. 83-87.

Different types of furnaces and ovens; calculations and data on their performance, fuel consumption, operating efficiency, etc. Recirculation of gases results in more uniform temperature distribution and in reduced fuel consumption.

16A-114. The Use of Gas in the Foundry. A. C. Jennings. *British Cast Iron Research Association Journal of Research and Development*, v. 3, Oct. 1949, p. 121-128; discussion, p. 129-132.

Varied uses. Includes excellent equipment photographs.

16A-115. Protective Atmospheres in Industry. Parts XI and XII. A. G. Hotchkiss and H. M. Webber. *General Electric Review*, v. 52, Nov. 1949, p. 30-37; Dec. 1949, p. 46-54.

Part XI: General principles, procedures, and equipment for safe handling of protective atmospheres. Part XII: Typical heat treatment applications and new methods for bright annealing metals. (To be continued.)

16A-116. Infrared Oven Triples Core-Drying Capacity. *Steel*, v. 125, Dec. 19, 1949, p. 86.

16B—Ferrous

16B-1. Walking Beam Furnace Keeps Spring Leaves Aligned as They are Heated. *Industrial Heating*, v. 15, Dec. 1948, p. 2112, 2114.

New furnace specifically designed and built to heat spring leaves prior to forming.

16B-2. Problems in Fuel Efficiency. C. Hulse and R. J. Sarjant. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 5-29; discussion, p. 74-76.

Problems relating to the efficient use of fuel in the iron and steel industry; possible solutions and lines of approach for future developments. 16 ref.

16B-3. Fuel Utilization in Iron and Steel Works. N. H. Turner and F. A. Gray. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 30-38; discussion, p. 74-76.

Discusses the above on the basis of results obtained at a certain British works.

16B-4. Factors Controlling Furnace Efficiency in the Steel Industry. H. C. Armstrong. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 111-112; discussion, p. 130-133.

16B-5. Gas Producers in the Iron and Steel Industry. F. A. Gray. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 139-140; discussion, p. 150-161.

Operating procedures.

16B-6. Use of Oil in Open-Hearth Steel Furnaces. W. F. Cartwright. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 174-176; discussion, p. 182-185.

Advantages.

16B-7. Oil Firing in the Ferrous Metals Industry. A. Stirling. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 176; discussion, p. 182-185.

Discussed on the basis of actual experience.

16B-8. Coal Preparation for the Production of Coke to be Used in a 2000 Ton Blast Furnace. E. J. Gardner. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1463-1464.

Methods used by Inland Steel. Comparative data for hand loaded and machine loaded coal.

16B-9. Lustron Furnaces Have "Ware Silhouettes", Traveling Thermocouples and "Kinetic Air Plugs", *Finish,* v. 6, Jan. 1949, p. 41.

Two unusual features of above porcelain-enameling furnaces: In combination with an electric-eye arrangement the "silhouette" prevents improperly hung porcelain enameled ware from entering the furnace by stopping the conveyor-chain when a light beam is broken. A traveling-thermocouple arrangement measures ware temperatures simultaneously at three horizontal levels. The temperature curves are electronically recorded.

16B-10. Coke Oven Expansion and Blast Furnace Operation in 1948. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 67-70.

New installations and technological developments.

16B-11. Soaking Pits; Some Experiences With Firing and Control. H. V. Flagg. *Iron and Steel,* v. 22, Jan. 1949, p. 33-36.

Experiences at Armco's Middletown, Ohio, plant since 1928.

16B-12. Investigation by Models of a System Involving Radiation, Fusion and Gas Flow. M. W. Thring. *Research,* v. 2, Jan. 1949, p. 36-42.

Two models of the openhearth heat-flow system are described, one corresponding to diffusion-combustion of luminous flames whose radiation peak shifts according to the relation between the ratio of the heat radiated to the heat input and the mixing length; and the other corresponding to heating and melting by radiation from above a pile of irregularly shaped solids which sink in their own melt. 16 ref.

16B-13. Versatility of Induction Heating Exploited in Producing Tractor Parts. J. D. Graham, H. F. Kincaid, and R. E. McGee. *Steel,* v. 124, Jan. 31, 1949, p. 62-64, 80.

Equipment and procedures used in heating for forging, hardening, tempering, brazing, soldering, and shrinking at International Harvester's new Louisville plant.

16B-14. Design Suggests Means for Reducing Time of Open-Hearth Heats. *Steel,* v. 124, Jan. 31, 1949, p. 68, 71.

A movable roof section permits rapid charging of scrap, and a pouring nozzle built into the furnace bottom permits tapping the heat directly into molds, casting machine, or ladles.

16B-15. Heating and Treatment of Alloy Steels. A. H. Arbogast and M. K. Morris. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 75-78; discussion, p. 78-81.

New toolsteel annealing furnaces that use, on the average, a mixture of 6000 cu. ft. of nitrogen and 315 cu. ft. of propane. The fuel rate is 300 lb. of bituminous coal per ton of steel; no decarburization occurs, and carburization does not exceed 0.005 in. on a side.

16B-16. Fast Open Hearth Charging. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 126-127.

See abstract from *Steel,* item 16B-14, 1949.

16B-17. Forging Furnace Handles Variety of Steels With Minimum of Scale. *Industrial Heating,* v. 16, Jan. 1949, p. 66, 68.

Slot furnace recently installed at Steel Improvement and Forge Co.

16B-18. The Production of Sheet Steel Modernized at Irvin Works by Carnegie-Illinois. *Industrial Heating,* v. 16, Jan. 1949, p. 70-74, 76, 78, 80, 138, 140.

Major additions to steel-producing facilities, including furnaces, conveyors, shearing equipment, pickling equipment, and handling equipment.

16B-19. Heating for Hardening and Forging With RF Equipment. Thomas E. Lloyd. *Iron Age,* v. 163, Feb. 17, 1949, p. 86-92.

Economies resulting from the use of induction heating for heating forging billets and for heat treating of parts.

16B-20. A Combined Carburizing and Nitriding Furnace. I. J. Lomas. *British Steelmaker,* v. 15, Jan. 1949, p. 33-36.

16B-21. Earthquake-Proof Blast Furnace Structure. *Iron Age,* v. 163, Mar. 10, 1949, p. 120.

Built for a Chilean company by a New York firm.

16B-22. A Combined Carburizing and Nitriding Furnace. II. J. Lomas. *British Steelmaker,* v. 15, Feb. 1949, p. 82-85.

Furnace made in the U. S.

16B-23. A New 170-Ton Open Hearth. E. Voet. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 112.

Furnace recently built in Holland includes several innovations not typical European practice.

16B-24. The Application of Dry-Coke Cooling Plants to Integrated Iron and Steel Works. L. H. W. Savage and A. V. Brancker. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 103-117.

The main points of difference between three types of dry-coke cooling plants and their influence on coke-oven operation. Cost estimates for a series of conditions. The influence of dry cooling on size and quality of the coke, and effect of the plant on the fuel and power balance of an integrated works.

16B-25. Fundamental Electric Terms. A. R. Oltrogge. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 261-267.

Problems of getting the most from an arc-furnace electric circuit.

16B-26. Operation of the Panel Board of an Electric Furnace. Frank W. Cramer. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 267-280.

Special reference to functions of meters and control equipment.

16B-27. Review of Furnace Maintenance. Murray J. Miller. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 60-61; discussion, p. 62-65.

Bottoms, banks, taphole, and flush-hole repairs. Tabulated data on out time by months from Republic Steel Corp.

16B-28. Increasing Firing Rates. H. S. Hall. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 66-68.

Methods for maximum heat transfer from flame to bath.

16B-29. Heating Open-Hearth Furnaces. John J. Hazel. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 156-157; discussion, p. 157-159.

Value of controlled heating.

16B-30. Modern vs. Old-Type Soaking Pits for Steel Ingots. F. N. Hays. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 255-262; discussion, p. 262-265.

Heat distribution, combustion space, temperature control, and overcharging. The modern soaking pit.

16B-31. Beziehungen zwischen der spezifischen Leistung von Hochöfen und ihrem Koksverbrauch. (Relation Between the Specific Efficiency of Blast Furnaces and Their Coke Consumption.) Fritz Wesemann. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 1-8.

A critical evaluation of statistical data and a study of measures designed to reduce the consumption of coke in the smelting of iron.

16B-32. Herstellung von Ferrolegierungen im Elektroöfen und Folgerungen fur den Stahlwerker. (The Production of Ferroalloys in the Electric Furnace and Instructions to the Steel Worker.) Harro Werwach. *Stahl und Eisen,* v. 68, Jan. 1, 1948, p. 8-14.

The efficient melting of eight different ferroalloys, giving recommendations for saving electricity. The principal features of a ferrosilicon furnace.

16B-33. Breite der ringförmigen Verbrennungszone bei neueren nordamerikanischen Hochöfen. (Width of the Annular Combustion Zone of Modern North American Blast Furnaces.) Ernst Krebs. *Stahl und Eisen,* v. 68, June 17, 1948, p. 235-236.

A mathematical correlation of the area of the combustion zone to the rate of coke consumption and the diameter of the hearth.

16B-34. Neuere Erfahrungen mit Heisswindkupolöfen. (Recent Experiences With Hot-Blast Cupola Furnaces.) Karl Roesch. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Dec. 1948, p. 165-169.

Development, principles, and mechanism. Advantages and disadvantages. 11 ref.

16B-35. Die Wirkung des Heisswindes auf die Verbrennungsvorgänge im Kupolöfen. (The Effect of the Hot Blast on Combustion in the Cupola Furnace.) Otto Gunthner. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Dec. 1948, p. 169-171.

A critical evaluation; operating principles.

16B-36. Earthquake-Proof Blast Furnace Substructure. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 360. Also *Iron and Steel Engineer,* v. 26, Mar. 1949, p. 110.

Chilean installation.

16B-37. Continuous Induction Heating Setup Expedites Rock-Bit Forging. W. J. Assel. *Steel,* v. 124, Mar. 28, 1949, p. 66-67.

Utilization of electric induction heating for raising to forging temperature a continuous piece of round bar stock used in the production of removable rock bits.

16B-38. 5-Zone Rotary Furnace Employed to Heat Billets for Piercing. *Steel,* v. 124, Mar. 28, 1949, p. 88, 91-92, 94, 96.

New doughnut-type unit of the National Tube Co. rated at 50 tons per hour when heating sections 8 in. diam. and 16 ft. long to 2350° F. Maximum fuel input when burning either coke oven gas, fuel oil, or natural gas is 1¼ million B.t.u. an hour. Employs automatic charging.

16B-39. Fabricated Pipe Material Production. Arthur Q. Smith. *Industrial Gas,* v. 27, Mar. 1949, p. 10-11, 28-29.

Furnaces used in pipe-fabricating operations.

16B-40. Die Erwärmung von Metallen mittels Hochfrequenz. (Heating Metals With the High-Frequency Current.) A. Leemann. *Zeitschrift fur Schweisstechnik (Journal de la Soudure),* v. 39, Feb. 1949, p. 33-37.

A comprehensive discussion of the high-frequency method of hardening the surfaces of steel parts. Photographs show different types of inductors, case-hardened machine parts, parts welded with the high-frequency current, and a high-frequency current generator. The effect of wattage per unit area on the depth of case hardening.

16B-41. Gaswirtschaft beim Ein-Hochofen-Betrieb auf Eisenhuttenwerken. 1. Generatorbetrieb eines Hochofens bei einem reinen Hochofenwerk. (Gas Economy in the Operation of a Single Blast Furnace in Steel Plants. 1. Operation of a Blast-Furnace Generator in a Strictly Blast-Furnace Plant.) Alfred Reckmann. **2. Massnahmen und Erfahrungen beim Ein-Hochofen-Betrieb.** (Methods and Experiences in Operation of a Single Blast Furnace.) Herbert Pohl. **3. Ein-Hochofen-Betrieb auf einem gemischten Huttenwerk.** (Blast-Furnace Operation in a Diversified Steel Mill.) Henno Franz Strähuber. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 151-158.

Part 1: the economics of combining smelting with coking for production of illuminating gas. Part 2: the flow of blast-furnace gas in multi and single-furnace operation. Economy of the system and means of avoiding gas losses. Part 3: a general discussion of the economy of the entire steel plant and the distribution of blast-furnace gas to the various operations.

16B-42. Gasabzugsrohre am Hochofen. (Gas-Exhaust Tubes on the Blast Furnace.) Kurt Guthmann. *Stahl und Eisen,* v. 68, Dec. 2, 1948, p. 481-482.

The problem of wear. Practical suggestions concerning arrangement and optimum tube diameter as well as maximum rate of gas flow. The principal cause of wear is the abrasive action of the flue dust and any means that will reduce the amount of this dust will prolong the life of the tubes.

16B-43. Statistiques des caractéristiques chimiques & physiques des différents cokes sidérurgiques consommés en France & dans divers pays étrangers de 1934 a fin Décembre 1947. (Statistics Concerning the Physical and Chemical Characteristics of Different Metallurgical Cokes Used in France and Other Foreign Countries During the Period 1934-1947, Inclusive.) C. G. Thibaut. *L'Institut de Recherches de la Sidérurgie (IRSID),* (Saint-Germain-en-Laye, France), ser. A, no. 3, Sept. 1948, 21 pages.

Presents in tabular form information for France, Belgium, Germany,

Saar Region, Holland, and Great Britain.

16B-44. Method of Utilization of Heat From the Cooling Water in Open-hearth-Furnace Installations. (In Russian.) A. D. Akimenko and P. G. Sedov. *Promyshlennaya Energetika* (Industrial Power), v. 5, Dec. 1948, p. 6-8.

Theoretically indicates possibility. Proposes a scheme of utilization based on obtained theoretical data.

16B-45. Fours électriques de fusion de la fonte. (Electric Furnaces for Melting of Cast Iron.) Gabriel Joly. *Fonderie*, Jan. 1949, p. 1456-1457.

Details of radiant-arc and graphite-electrode types. Advantages and disadvantages of each.

16B-46. The Production Aspects of Fuel Efficiency at Corby Iron and Steel Works. A. Stirling. *Journal of the Institute of Fuel,* v. 22, Feb. 1949, p. 166-174.

The principal characteristics of the lean Northamptonshire ores which are of practical importance in ironmaking and the need for close control of crushing and blending. Deterioration in recent years in the quality of coking slacks and metallurgical coke in relation to their effect on coke usage in the Corby blast furnaces. The principles of acid burdening; and the consistency of heat input to the blast furnaces when allowance is made for ash content of the coke. Full-scale experimental data for a heat balance in a modern basic bessemer converter. 15 ref.

16B-47. Modern Heating Methods for the Steel Forge Plant. Charles C. Eeles. *Steel Processing,* v. 35, Mar. 1949, p. 149-154, 161-162.

Modern furnace equipment of various types for various jobs. Advantages of gas-oil fired equipment for forge heating.

16B-48. Chemical Process Simplifies Cleaning of Gas Washers and Precipitators. J. M. Howell. *Steel,* v. 124, Apr. 11, 1949, p. 101-102, 104, 107.

Method for servicing blast-furnace gas-cleaning equipment without interrupting operation of vessel or slacking of blast. Technique removes scale and sludge from wet and dry units.

16B-49. Heating Seamless Tubes for Sizing. *Iron Age,* v. 163, Apr. 14, 1949, p. 86-88.

Continuous tube reheating equipment of special design. The 13 heating furnaces are of cylindrical construction, and each has a heating chamber equipped with 16 burners, each containing a tip with a number of accurately-sized, uniform ports. From these ports the gas-air mixture is directed so that each flame sweeps the surface of the burner-cup cavity which acts as a radiant surface.

16B-50. Some Aspects of the Breakage of Coke. H. H. Lowry and Benjamin Epstein. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 3-23; discussion, p. 23-27.

Breakage mechanisms in general. It is indicated that conventional tests are not sufficiently informative and should be replaced by tests that give information at more than one point. Recommends use in future investigations of the effect of coke quality on blast-furnace performance of cokes having strength properties covering a wide range relative to errors of measurement. 17 ref.

16B-51. Construction of Firebrick Hearth and Operation of Jones and Laughlin Steel Corporation's No. 3 Blast Furnace at Aliquippa, Pennsylvania. Elmer H. Riddle. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 127-129; discussion, p. 129-130, 153-171.

16B-52. Carbon Hearths in Republic Blast Furnaces. Frank H. Janecek. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 130-138; discussion, p. 138-139, 153-171.

Design features.

16B-53. Use of Small and Large Blocks in Carbon Hearth Construction. William C. Bennett. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 139-145; discussion, p. 153-171.

Deals only with brick and block bottoms, giving experiences with three installations. Recommendations for type of construction. Carbon hearths were found to be satisfactory in every way, the blocks being considered superior to brick.

16B-54. Design of Carbon Hearth at Zenith Furnace. R. W. Thompson. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 146-148; discussion, p. 153-171.

Single-bottom, single-hearth-wall construction.

16B-55. Design of Carbon Hearth and Carbon Tapping Hole. H. E. McDonnell. *Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 7, 1948, p. 148-153; discussion, p. 153-171.

Performance experiences.

16B-56. Progress and Problems in Blast Furnace Design. C. G. Hogberg. *Blast Furnace and Steel Plant,* v. 37, Apr. 1949, p. 442-444. A condensation.

Practical and theoretical effects of furnace volume on blast-furnace performance.

16B-57. The Conversion to Oil Firing of the Open-Hearth Furnaces at Park Gate Works. D. F. Marshall and H. C. White. *Journal of the Iron and Steel Institute,* v. 161, Apr. 1949, p. 301-317.

Reasons for making the conversion and properties of the principal available fuels. Operating results: shop layout, type of charge, and furnace performance. Flow characteristics of three types of burner and details of the influence of roof temperature on the rate of furnace working. The life of the refractories used, and essentials for fully automatic furnace control.

16B-58. Designs Simple Type of Cupola Dust and Spark Arrestor. *Foundry,* v. 77, May 1949, p. 148.

Arrestor designed and used by the Pohlman Foundry Co.

16B-59. Fuel Oil in the Steel Industry. A. J. Fisher. *Iron and Steel Engineer,* v. 26, Apr. 1949, p. 55-70; discussion, p. 70-71.

The diminishing supply and the problems it presents to the engineer. Various furnaces and their fuel consumption. Numerous tables on fuel-oil production and consumption.

16B-60. Series of Cylindrical Chamber Furnaces Reheat Pierced Tubes for Sizing at Gary Works of National Tube Co. *Industrial Heating,* v. 16, Apr. 1949, p. 586-592, 594, 596.

16B-61. Fuel Efficiency in the Blast Furnace. R. P. Towndrow. *Journal of the Institute of Fuel,* v. 22, Apr. 1949, p. 222-227.

Reviews developments during the present century in the manufacture of fuel for blast furnaces, the preparation of raw materials for smelting, and the design of furnace charging and blowing equipment. Thermal and chemical requirements of the furnace, and heat balance based on recent data for a large modern blast furnace.

16B-62. Heating, Forming and Bending. William A. Theil. *Industry and Welding,* v. 22, May 1949, p. 43-45, 73-75.

Use of the oxy-acetylene torch. Emphasis is on steel.

16B-63. Entwicklungsmöglichkeiten des electrischen Verhuttens. (Future Prospects for Electric Smelting.) Robert Durrer. *Nederlands Instituut voor Electrowarmte en Electrochemie,* "Transactions of the Second International Congress on Electroheat and Electrochemistry", 1947, p. 243-247; discussion, p. 347-366.

Under present conditions, above prospects for iron-ore smelting seem quite limited. However, the picture would be greatly changed if it were possible to transform the process so that the high-grade heat would only be used where absolutely necessary. These demands could be realized by combining a shaft-furnace with a rotary-furnace.

16B-64. Entwicklung der Hochofenprofile in verschiedenen Ländern. (Development of Blast Furnace Profiles in Different Countries.) Paul Wolf. *Stahl und Eisen,* v. 66-67, Dec. 4, 1947, p. 411-416.

Reasons for the different blast-furnace profiles. Shapes and dimensions. Statistical data.

16B-65. Oil-Firing Conversion; The Open-Hearth Furnaces at Park Gate Works. D. F. Marshall and H. C. White. *Iron and Steel,* v. 22, May 12, 1949, p. 197-205; discussion, p. 265-267.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 16B-57, 1949.

16B-66. Dry-Coke Cooling; Application to Integrated Iron and Steel Works. L. H. W. Savage and A. V. Brancker. *Iron and Steel,* v. 22, May 12, 1949, p. 259-265.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 16B-24, 1949.

16B-67. Oxygen as a Factor in Combustion of Fuel in the Open Hearth Furnace. D. D. Howat. *Journal of the West of Scotland Iron and Steel Institute,* v. 55, 1947-48, p. 176-221.

Quantitatively the effect of increase in available heat per unit volume of combustion gases, with consequent increase in temperature and radiating power of the flame, produced by employment of oxygen, on the downward heat flow from the flame and the net heat to the steel bath.

16B-68. Der Induktionskupolofen. (The

Induction Cupola Furnace.) Eugen Piwowarsky. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Apr. 1949, p. 104-106.

To overcome the difficulties caused by low coke quality, a combination of cupola furnace and high or low-frequency induction furnace is proposed, in which the inductively heated furnace hearth is charged with coke or other carburizing materials, or else with highly refractory noncarbonaceous substances. Experimental results and proposed equipment.

16B-69. Wplyw wielkosci ziaren mieszanek Weglowych na wlasnosci koksu wielkopiecowego. (Influence of Grain Size on Coal Blends on Blast-Furnace-Coke Properties.) M. Czyzewski and F. Byrtus. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 73-81.

Laboratory test made for determination of optimum conditions for coking in order to obtain blast-furnace coke of higher mechanical properties. Improvement in coke quality may be achieved by coking adequately selected blends which have a definite crushing strength.

16B-70. Tata "A" Blast Furnace Makes Over Three Million Tons. E. T. Warren. *Blast Furnace and Steel Plant,* v. 37, June 1949, p. 673-675.

Experiences with Indian furnace described in the May 1940 issue. During over 8 yrs., the furnace was never blown out. Production figures and chemical analysis of the refractories used in four locations.

16B-71. Recent Steelplant Developments at the Appleby-Frodingham Steel Company. A. Jackson. *Journal of the Iron and Steel Institute,* v. 162, June 1949, p. 136-162.

Numerous diagrams, tables, graphs, and illustrations. Layout, mixer practice and design, furnace design and refractories, operation, and instrumentation.

16B-72. Variety of Furnaces Used in Fabricated Pipe Production. Arthur Q. Smith. *Industrial Heating,* v. 16, June 1949, p. 996, 998, 1000, 1002, 1004.

16B-73. (Book). **Anhaltszahlen Fuer Die Waermewirtschaft Auf Eisenhuettenwerken.** (Average Values for Heat Economy in Iron and Steel Works.) Ed. 4. K. Rummel, editor. 213 pages. 1947. Stahleisen, Duesseldorf, Germany. (U. S. agent: Stechert-Hafner, Inc., 31 East 10th St., New York 3, N. Y.) $11.75.

Like former editions, this book treats fuel and power consumption in the coke plant, the blast furnace plant (including sintering), the converter plant, openhearth plant, electric-furnace shop, rolling mill and forge shop, foundry, heat treating department, water supply, gas-producers, power plant, space heating, also fuel and energy consumption of integrated works. Begins with the fundamentals of heat and furnace engineering, and ends with tables for metallurgical reactions and reaction heats.

16B-74. Improved Heat Treating at Standard. *Baldwin,* v. 5, 1st and 2nd qtr., 1949, p. 13-15.

Rotary heat treating furnace was designed for the controlled heating of individual steel ingots preparatory to press forging them into blooms and blanks in the primary steps of producing wrought-steel wheels for railroad and industrial service.

16B-75. De koepeloven. (The Cupola Furnace.) M. Stap. *Metalen,* v. 3, May 1949, p. 196-205.

Construction, the melting process and the gases formed during the melting operation.

16B-76. Flow of Gases in Open-Hearth Furnaces. *Refractories Journal,* June 1949, p. 193-195. Based on paper by J. H. Chesters.

Control of roof temperature and damage due to dust carried up from the charge.

16B-77. Gas-Fired Litho Ovens Speed Can Production. Arthur Q. Smith. *Industrial Heating,* v. 16, July 1949, p. 1236-1238, 1240, 1242-1244.

16B-78. The Effect of High Coke Oven Gas Firing on Open Hearth Operation. J. Jaicks. *Blast Furnace and Steel Plant,* v. 37, July 1949, p. 808-812.

It was found that coke-oven gas can be fired in sizable amounts throughout the entire heat cycle without furnace damage; that the gas can be substituted for fuel oil with few adverse effects up to a certain point; and that the slight increases in sulfur contamination were insufficient to disqualify any appreciable portion of the heats. Optimum amount of gas was that furnishing about 30% of the total Btu. input.

16B-79. Coke Quality. Its Effect on Cupola Operation. W. J. Driscoll. *Iron and Steel,* v. 22, July 1949, p. 349-353.

Effects of variations in coke. Some coke properties, using a diagrammatic representation of combustion reactions taking place in the cupola and of the gas analyses and temperatures resulting therefrom. 24 ref.

16B-80. Ingot to Coiled Hot Strip in Six Minutes. Dan Reebel. *Steel,* v. 125, July 25, 1949, p. 67-68, 70.

New oscillating roller-type hearth furnace recently completed.

16B-81. Comparative Advantages of Modern Soaking Pits. E. A. Brown, Jr. *Steel,* v. 125, Aug. 15, 1949, p. 94-96, 127-128, 130, 132.

Factors to consider in the selection of soaking pits. Firing details of the six principal standard types.

16B-82. Furnaces for Gas Carburizing; Design and Operation. S. L. Widrig and Wilson T. Groves. *Metal Progress,* v. 56, Aug. 1949, p. 194-199.

An interesting variant from conventional practice consists of carburizing at 1725, intermediate cooling to 1150 and reheating to 1550° F. (all in one trip through a continuous furnace), oil quenching, washing, and then drawing at 340° F. This increases production rate of heavy parts for automotive transmissions, and produces, in SAE 8620 or 4320 gear teeth, a superior microstructure consisting of fine-grained, relatively low-carbon martensite, with some excess carbide in the surface zone. Such carbides greatly increase wear resistance and do not harm impact properties if well distributed.

16B-83. Open-Hearth Furnace Models. Part I. Flow Patterns in Ducts. J. H. Chesters and A. R. Philip. **Part II. Flow Visualization and Photography.** R. S. Howes and A. R. Philip. **Part III. Flow Patterns in Model Furnaces.** I. M. D. Halliday and A. R. Philip. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 385-415.

Part I: Flow patterns obtained in various two-dimensional shapes when water is introduced through jets and allowed to escape over weirs. Entrainment, recirculation, and the stability or instability of certain cross sections are reached. Flow patterns were studied by means of photography of water containing graded bakelite powder moving in transparent dishes of various shapes and with differently arranged jets. Part II: installation and operation of 1/24 scale-model openhearth furnaces in which water is circulated to represent gas and air. Photographic and other techniques used. Part III: the extent to which flow through a water model is comparable with flow of gases through a full-scale furnace. Flow pattern observed in openhearth furnace models of Maerz, single air-uptake, and semi-Venturi design and effects of certain modifications. 62 ref.

16B-84. Experiments on Gaseous Mixing in Open-Hearth Furnace Models. Part I. Maerz. R. D. Collins and J. D. Tyler. *Journal of the Iron and Steel Institute,* v. 162, Aug. 1949, p. 457-466.

A technique using models was applied to some designs of producer-gas-fired openhearth furnaces. CO_2 was used as a tracer and concentrations were measured by means of an infrared gas analyzer. Designs tested are essentially of the Maerz type, but one semi-Venturi type is included for comparison. Use of a central air port shows considerable improvement as regards mixing.

16B-85. Der Einfluss des Gichtdurchmessers auf das Verhalten des Feingutes im Hochofen. (Effect of Throat Diameter on the Behavior of Small-Particle Charges in the Blast Furnaces.) Paul Reichard. *Stahl und Eisen,* v. 69, July 21, 1949, p. 503-508.

Effects of a widened throat on gas velocity, dust formation, and dust accumulation. Volume, composition, and velocity of gas flow in the various sections of the furnace and pressure on the charge are calculated. Conditions that cause accumulation of dust in the blast furnace.

16B-86. Strömung und Gichtstaubentfall im Hochofen. (Flow and Dust Emission From the Throats of Blast Furnaces.) Michael Hansen. *Stahl und Eisen,* v. 69, July 21, 1949, p. 526-528.

Discussion of paper by Paul Reichardt on "Effect of Throat Diameter on the Behavior of Small-Particle Charges in the Blast Furnace." See item 16B-85.

16B-87. Spotreba koksu ve vysoke peci. (Coke Consumption in the Blast Furnace.) Bohumil Splichal, Jr. *Hutnické Listy,* v. 4, May 1949, p. 139-141.

Effect of blast temperature, at constant ash content of the coke, in production of hot and cold irons.

16B-88. Ohio Firm Reveals Details of Its New Shaft-Type Electric Blast Furnace. *Iron Age,* v. 164, Sept. 1, 1949, p. 101.

Schematic diagram and brief description of silvery-iron plant of Cascade Iron Corp.

16B-89. The Application of Electric Heat to Iron Production, Processing, and Refining. G. W. Keller. *Brown Boveri Review,* v. 36, May-June 1949, p. 191-201.

16B-90. Mary Blast Furnace; Last of Hand-Filled Stacks in America. John D. Knox. *Steel,* v. 125, Oct. 10, 1949, p. 136, 138, 140, 142, 144.

Furnace of the Sharon Steel Corp., Lowellville, Ohio.

16B-91. Open Hearth Maintenance. C.

W. Conn. *Iron and Steel Engineer,* v. 26, Sept. 1949, p. 74-75; discussion, p. 75-76.

Practices used by the Ford Motor Co.

16B-92. Maintaining Hearths in Heating Furnaces and Soaking Pits. Charles N. Jewart. *Iron and Steel Engineer,* v. 26, Sept. 1949, p. 116-119; discussion, p. 119-121.

Maintenance of batch-type regenerative furnaces and single, double, and triple-fired continuous furnaces with recuperators.

16B-93. Construction and Operation of an Oil-Fired Malleable Iron Holding Furnace. F. Coghlin, Jr. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 518-525; discussion, p. 525-527.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-18. See item 16b-41, 1948.

16B-94. Pipe Processing With Gas. Charles F. Dabney. *Industrial Gas,* v. 28, Oct. 1949, p. 5-6, 28.

Equipment and procedures for bending, stress relieving, annealing, and cutting pipe, using gas as heating fuel.

16B-95. Largest Carburizing Plant Is Completely Automatic. Arthur Q. Smith. *Industrial Gas,* v. 28, Oct. 1949, p. 9-10, 28.

16B-96. Latest Developments in Heating and Heat Treating. H. M. Heyn. *Industrial Gas,* v. 28, Oct. 1949, p. 11-13, 26.

Some of the latest equipment developed by Surface Combustion Corp.

16B-97. The Use of Gradiation Heat in Seamless Tube Production. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Oct. 1949, p. 115-116, 118-120, 122, 124, 126.

Application of process to annealing, tempering, normalizing, and heating for forming and forging in production of seamless tubes.

16B-98. Ferrous Melting Furnaces in the United States and Canada. A. W. Gregg. *American Foundryman,* v. 16, Oct. 1949, p. 27-32.

A condensed version of the Official Exchange Paper from AFS to International Foundry Congress.

16B-99. Bearing Balls Hardened Within Close Limits in Automatic-Shaker-Hearth Furnace. J. H. Bradley. *Industrial Heating,* v. 16, Oct. 1949, p. 1734, 1736, 1881.

16B-100. Processing Steel Core Laminations for Electric Products. *Industrial Heating,* v. 16, Oct. 1949, p. 1749-1750, 1752, 1832, 1834.

Enamel-baking oven protected by interlocked safety control of handling, heating, temperature, and circulation.

16B-101. Some Modifications in Cupola Design. E. S. Renshaw and S. J. Sargood. *Foundry Trade Journal,* v. 87, Oct. 13, 1949, p. 449-456.

Modifications introduced successively in an attempt to reduce refractory consumption and increase operating efficiency. Hypothetical slag reactions as an aid in obtaining better slag control. Work on the application of water cooling to the basic cupola, with a table of slag and metal analyses showing the extent of desulfurization obtained.

16B-102. Tracer Study of Sulphur in the Coke Oven. S. E. Eaton, R. W. Hyde, and B. S. Old. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 176, 1948, p. 343-362.

Previously abstracted from *Metals Technology.* See item 16b-105, 1948.

16B-103. How Oldsmobile Uses Induction Heat for Forging. Willard L. Mautz. *Iron Age,* v. 164, Nov. 17, 1949, p. 81-85.

Better forging-die life, savings in raw material, lack of scale, ease of stock handling, and cleanliness result from use of this method. Equipment and layout, and typical production data.

16B-104. British Investigations of Modified Cupola Designs. E. E. Renshaw and S. J. Sargood. *Iron Age,* v. 164, Nov. 17, 1949, p. 86-91.

Previously abstracted from *Foundry Trade Journal.* See item 16B-101, 1949.

16B-105. New Soaking Pit Installation Controls Ingot Temperatures Within Plus or Minus 10° F. Dan Reebel. *Steel,* v. 125, Nov. 21, 1949, p. 90-91.

Installation at Allegheny Ludlum Steel Corp. Dry mill scale is used for the bottom instead of coke. This results in an extra long bottom life of 9-10 months.

16B-106. Annealing Stainless Clad Steel Sheets. E. W. Weaver. *Iron Age,* v. 164, Nov. 24, 1949, p. 77-80.

Annealing light-gage stainless-clad sheets by standard methods use for solid stainless or clad plate produced undesirable scale characteristics and made pickling difficult. New furnace produces a scale light enough to permit cutting the pickling time in half.

16B-107. Improved Metallurgical Properties Obtained by Rapid Quenching of High Manganese Steels at Damascus Steel Casting Co. *Industrial Heating,*

v. 16, Nov. 1949, p. 1940-1942, 1944, 1946, 2080.
New 50-ton car-type furnace with side-dump tilting hearth and its use for automatic heat treating of high-Mn steels.

16B-108. Large Annealing Furnace Accommodates Two Railroad Cars at the General American Transportation Corp. Plant. Arthur Q. Smith. *Industrial Heating,* v. 16, Nov. 1949, p. 1950-1952, 1954, 1956.

16B-109. Blast Furnace Has All-Welded Earthquake-Proof Substructure. *Industrial Heating,* v. 16, Nov. 1949, p. 2046-2047.
Blast furnace in Chile.

16B-110. Heat Treating Railroad Tank Cars. Arthur Q. Smith. *Industrial Gas,* v. 28, Nov. 1949, p. 3-4, 25-26.
Huge gas-fired annealing furnace in which entire cars are heat treated.

16B-111. Automatic Gas-Fired Forge Furnaces. James R. Ross. *Steel Processing,* v. 35, Nov. 1949, p. 606, 614.
New furnace of Chevrolet Forge Div., General Motors Corp.

16B-112. O.H. Furnace Models. Part I. Flow Patterns in Ducts. J. H. Chesters and A. R. Philip. **Part II. Flow Visualization and Photography.** R. S. Howes and A. R. Philip. **Part III. Flow Patterns in Model Furnaces.** I. M. D. Halliday and A. R. Philip. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 527-540; discussion, p. 598-601.
Previously abstracted from *Journal of the Iron and Steel Institute.* See item 16B-83, 1949.

16B-113. Gaseous Mixing; Experiments on Open-Hearth Furnace Models. R. D. Collins. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 541-544; discussion, p. 598-601.
Previously abstracted from *Journal of the Iron and Steel Institute.* See item 16B-84, 1949.

16B-114. Some Aspects of Salt Bath Furnaces Discussed in Their Application to the Wire Industry. Parts One and Two. B. M. Pearson. *Wire Industry,* v. 16, Oct. 1949, p. 811, 813; Nov. 1949, p. 889-891, 893.
Various types of salt bath furnaces and their advantages and disadvantages. Different heat treatment processes used in the wire mill. Hazards and safety precautions. (To be continued.)

16B-115. Controlled Atmospheres for Forging and Tool Steels. Part I. Lester F. Spencer. *Steel Processing,* v. 35, Nov. 1949, p. 596-600.
Various types of equipment for production of controlled atmospheres. (To be continued.)

16B-116. Comparative Advantages of Modern Soaking Pits. E. A. Brown, Jr. *Industrial Heating,* v. 16, Nov. 1949, p. 1984, 1986, 1988, 1990, 1992, 1994, 1996.
Advantages and disadvantages of the various types. (To be continued.)

16B-117. Optimelt Automatic Recalibrating Control for Arc-Furnace Regulators. R. M. Bayle. *Journal of Metals* (Technical Section), v. 1, Dec. 1949, p. 14-19.
Electrical control system made by Westinghouse for use on d.c. arc furnaces for steel melting and refining. Advantages over hand regulation.

16B-118. Melts Steel in Oxygen—City Gas Fired Crucible Furnace. James M. Barrabee. *American Foundryman,* v. 16, Dec. 1949, p. 51-53.
Development of an efficient crucible furnace in which is possible, by using a mixture of city gas and oxygen, to produce sufficient heat to melt steel. The furnace was designed for use mainly in research work and special melting. Two methods for feeding fuel were used. The first provided for separate gas and oxygen inlets with mixing in an oval chamber at the bottom of the furnace. The second employed additional oxygen inlets and a different chamber to insure better mixing and more complete combustion.

16B-119. Metallurgical Control of Coil Annealing in Radiant Convector Furnaces. George B. Espey. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 99-107.
Advantages of the high-speed convection furnaces over older type, and their relative performance. Graphs and diagrams give temperature distributions, mechanical-property data, etc.

16B-120. A Hydraulic Method of Evaluation of the Quality of Metallurgical Coke. (In Russian.) K. I. Syskov and I. N. Nikolaev. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Aug. 1949, p. 1197-1208.
Newly developed method based on measurement of hydraulic properties, characterizing resistance of the mass of coke to movement of gases under conditions approximately corresponding to those of the blast furnace. Index of quality depends on toughness, uniformity of size of pieces, and amount of size reduction. 12 ref.

16B-121. Stufenversuche an einem schnellbeheizten Hochofenwinderhitzer. (Progressive Experiments With a Rapid-

Heating Blast-Furnace Blast Heater.) Marcel Steffes. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 687-691.

Study included all factors required for the evaluation of the heat balance and operating method. From the experimental data, two important indices were derived which can be used to estimate heating surface and the weight of the checker brick.

16C—Nonferrous

16C-1. Fuel Considerations in the Fabrication of Non-Ferrous Metals and Light Alloys. Leslie Aitchison. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 38-40; discussion, p. 74-76.

A comprehensive survey of factors affecting the efficient use of fuel in those copper and brass industries concerned with the manufacture of wrought goods, and similarly for wrought aluminum and Al alloys. The operation of furnaces, either for melting or for reheating, annealing, hot rolling, forging or extrusion; considers fuel consumption in heating and lighting.

16C-2. Fuel Efficiency in the Brass Foundry Pays Dividends. G. L. Harbach and F. Hudson. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 40-46; discussion, p. 74-76.

Reviews work of Association of Bronze and Brass Founders and results achieved in connection with fuel economy; comparative data on coke and oil-fuel melting; examples of further economies which may be achieved in the future.

16C-3. Furnace Design in the Non-Ferrous Metal Industry. F. C. Ashen. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 125-128; discussion, p. 130-133.

Design of the various types, indicating where improvements are most needed.

16C-4. The Gas Producer in the Non-Ferrous Industry. Leslie Aitchison. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 146-148; discussion, p. 150-161.

Reasons for limited use of the above.

16C-5. Oil Fuel for Non-Ferrous Metals. J. Sykes. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 177-178; discussion, p. 182-185.

Applications and advantages.

16C-6. Bronze Foundry Realizes Savings by Modernizing Melting Furnaces. Paul R. Hesse and Bruce Schafer. *Iron Age,* v. 163, Feb. 3, 1949, p. 122-124.

Program of modernization of three electric rocking furnaces resulted in savings of $1.23 a ton, and other benefits. Installation of automatic electrode controls, conical shells, and mechanical overtravel stops.

16C-7. Development of Muffle Furnaces for the Production of Zinc Oxide and Zinc at East Chicago, Indiana. Gunnard E. Johnson. *Journal of Metals,* v. 1, sec. 3, Feb. 1949, p. 118-124.

Development of an experimental and a commercial muffle furnace for treatment of Zn-base die-cast scrap for the production of zinc oxide and zinc. Details of construction; yields and compositions of products.

16C-8. Controlled Drying of Retorts. R. R. Furlong and D. H. Wertz. *Journal of Metals,* v. 1, sec. 3, July 1949, (*Metals Transactions,* v. 185), p. 393-394.

Process and equipment used at the Donora Zinc Works, Donora, Pa.

16C-9. Induction Melting of Titanium Metal in Graphite. J. B. Sutton. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 73-74; discussion p. 75-76.

See abstract from *Metal Progress,* item 2D-10, 1949.

16C-10. The Production and Arc Melting of Titanium. O. W. Simmons, C. T. Greenidge and L. W. Eastwood. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 77-90; discussion p. 90-91.

See abstract from *Metal Progress,* item 2D-12, 1949.

16C-11. Immersion Heaters Boost Production of Storage Batteries. *Industrial Heating,* v. 16, Aug. 1949, p. 1384.

16C-12. Practical Aspects of Fuel Utilisation in a Large Works. F. C. Ashen. *Journal of the Institute of Fuel,* v. 22, Aug. 1949, p. 313-320.

Fuel consumption data of plants forming a cross-section of the non-ferrous metal industry are analyzed to show the basic coal equivalents used for various main processes. Fuel aspects of some metallurgical processes. Effect on fuel economy of converting different types of metallurgical furnaces to the concentrated-combustion method of gas firing.

16C-13. Die Abhitzeverwertung bei den Unterharzer Metallhütten. (The Utilization of Waste Heat in the Unterharzer Smelters.) Wilhelm Westphal. *Zeitschrift für Erzbergbau und Metallhüttenwesen,* v. 1, Oct. 1948, p. 193-204.

Equipment used for the above in several different places in these plants, which include various types of smelters for production of Zn, Cu, and Pb.

16C-14. Nonferrous Melting With Induction Lift Coil Furnaces. W. J. Doelker. *Foundry,* v. 77, Oct. 1949, p. 76-77, 116, 119, 122.

Furnaces and procedures used by National Cash Register Co. to produce various castings from copper-base alloys.

16C-15. Protective Atmospheres for Annealing Non-Ferrous Wire. E. G. de Coriolis and O. E. Cullen. *Wire and Wire Products,* v. 24, Oct. 1949, p. 859-864, 976-981.

Equipment and procedures.

16C-16. Um Forno Aquecido por Combustao de Lenha para Copelacao de Chumbo. (A Lead-Smelting Furnace Modified for Use of Wood as Fuel.) Tharcisio D. de Souza Santos. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 375-388.

Smelting furnace specially designed for use on Brazilian lead ores and for the burning of wood.

16D—Light Metals

16D-1. Low-Frequency Melting; Twin Hearth Induction Furnace for Light Alloys. H. Capitaine. *Metal Industry,* v. 73, Dec. 17, 1948, p. 489-490.

Furnace which combines advantages of maximum output with minimum of attendance and low power consumption.

16D-2. Ein rinnenloser Netzfrequenz-Induktionstiegelofen zum Schmelzen von Magnesiumlegierungen. (A Channelless Polyphase High-Frequency-Induction Crucible Furnace for Melting Magnesium Alloys.) Gerhart Hennicke and Philipp Schneider. *Die Neue Giesserei,* v. 36 (new ser., v. 2), June 1949, p. 172-182.

Reasons for developing this new furnace and its principles of design and operation. Comparison with other furnaces.

16D-3. Die Casting Plant Cuts Costs by Induction Melting. F. J. Kamin. *Modern Metals,* v. 5, Aug. 1949, p. 27-29. Condensed from *Materials and Methods.*

Previously abstracted from original. See item 16d-4, 1948.

16D-4. Forni a combustione ed elettrici nell'industria dell'alluminio. Parte I. Forni di fusione. (Fuel-Fired and Electrically Operated Furnaces in the Aluminum Industry. Part I. Smelting Furnaces.) *Aluminio,* v. 18, June 1949, p. 273-296.

Efficiency of various types of furnaces, and actual operating data. Special attention to large basin-type smelting furnaces, chiefly of the induction, magnetic-core type.

16D-5. The Induction Furnace for Melting Aluminum. James H. Hamnett. *Modern Metals,* v. 5, Nov. 1949, p. 25-28.

Over-all effects of induction melting of Al for use in high-pressure die casting.

16D-6. A New Plant Design for the Flash Annealing of Aluminum and Its Alloys. *Sheet Metal Industries,* v. 26, Dec. 1949, p. 2605-2607.

Continuous "flash annealing" furnace designed and built in Britain.

SECTION XVII

REFRACTORIES and FURNACE MATERIALS

17-1. Some Considerations in the Use of Carbon Refractories in Blast Furnaces. W. S. Debenham. *Industrial Heating,* v. 15, Dec. 1948, p. 2168, 2170-2174, 2202. A condensation.

Previously abstracted from *Steel.* See item 17-67, 1948.

17-2. Silica and Fire Clay Refractories for Steel Plant Furnaces. C. A. Brashares. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 49-51; discussion, p. 52-53.

Claims that super-duty silica brick should give 15-25% increased life in sprung roofs on account of its higher melting point, higher refractoriness, and high mechanical strength.

17-3. Applications of Super-Refractories Made From Electric Furnace Products. Charles F. Geiger, Arthur A. Turner, and Otto R. Stach. *Chemical Engineering Progress* (Transactions Section), v. 44, Dec. 1948, p. 933-936.

Applications of silicon carbide, alumina, mullite, and also some new compositions consisting mainly of alumina.

17-4. New Alumina-Silica Refractories. G. Bickley Remmey. *Chemical Engineering Progress* (Transactions Section), v. 44, Dec. 1948, p. 943-946.

Properties and applications of different commercial varieties. Experimental and service results obtained in both glass and metallurgical furnaces.

17-5. Upper Useful Limits of Commercial Superrefractories. G. Bickley Remmey. *American Ceramic Society Bulletin,* v. 27, Dec. 15, 1948, p. 477-485.

Eighteen different brands of fabricated mullite and alumina refractories, as well as one zircon and one zirconia brick, were tested to determine their upper limits. The temperatures at which zircon and zirconia react with mullite and alumina.

17-6. The Selection and Use of Hot-Face Insulating Bricks. L. R. Barrett. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 93-98; discussion, p. 130-133.

Pros and cons of use of insulating bricks on various locations of openhearth furnaces. Properties of British hot-face insulating bricks; heat transmission.

17-7. The Selection of Refractory Materials in Relation to Fuel Economy. G. R. Rigby. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 99-111; discussion, p. 130-133.

Selection of refractory materials other than insulating products. How properties of these materials can influence fuel requirements.

17-8. Insulation From the Manufacturer's Standpoint. A. E. Hubbard. "Fuel and the Future." Vol. II. H. M. Stationery Office, London, 1948, p. 118-122; discussion, p. 130-133.

Advantages for large inudstrial furnaces, and some of the difficulties—mostly psychological—in securing its acceptance.

17-9. Refractory Materials for Reheating Furnaces. Advantages of Plastic-Chrome Construction. H. Parnham. *Refractories Journal,* v. 24, Nov. 1948, p. 391-401. Reprinted from *Iron and Coal Trades Review.*

Economic operation of reheating furnaces largely depends upon the life of the refractory material used in the hearth. Problems associated with the use of various refractory materials upon which steel ingots, bars, plates, blanks, and blooms are heated; methods by which some of the problems described may be overcome.

17-10. The Preparation of Laboratory Ware in Beryllia by Slip Casting. A. R. Edwards and F. Henderson. Division of Aeronautics, Council for Scientific and Industrial Research (Melbourne, Australia), S and M Note 174, Nov. 1948, 12 pages.

Method for preparation of the above for experimental work with

high-temperature alloys. Method features noncritical nature of various processes involved.

17-11. Properties and Uses of Pure Oxide Heavy Refractories. O. J. Whittemore, Jr. *Journal of the American Ceramic Society,* v. 32, Feb. 1, 1949, p. 48-53.

See abstract from *Materials & Methods,* item 17-100, 1948.

17-12. Olivine; Possible Alternative Material for Foundry Work. *Iron and Steel,* v. 22, Feb. 1949, p. 44.

Use of ferromagnesium silicate as a refractory and as a substitute for silica sand. Its great virtue is that it does not cause silicosis.

17-13. A Review of the Effects of Refractories on Cleanliness of Steel. Joseph G. Mravec. *Proceedings of the Electric Furnace Steel Conference, American Institute of Mining and Metallurgical Engineers,* v. 5, 1947, p. 22-28; discussion, p. 28-31.

Identification and distribution of refractory inclusions, evaluation of cleanliness, furnace runners, ladle lining, stopper-rod assembly, nozzles, hot tops, mold plugs, and pouring-pit practice.

17-14. Properties and Performances of Open Hearth Bottoms. Hobart N. Kraner. *Industrial Heating,* v. 16, Feb. 1949, p. 316, 318, 320-321. A condensation.

Problems involved in selection of proper materials. Desirable proportions of magnesia, dolomite, silica, and slag; advantages of using magnesite brick despite somewhat higher cost; detailed discussion of the economics of bad-bottom delay time vs. installation of new bottom. (To be continued.)

17-15. Standard Roof Life of Open Hearths. H. M. Kraner. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 159-160; discussion, p. 160-161.

Includes table which gives comparative data on life of roofs made of different refractories.

17-16. Pouring-Pit Refractories; Trends in Quality. L. A. Smith. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 161.

Trends in nozzles.

17-17. Standardization of Top Sleeves. W. S. Debenham. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 162-163; discussion, p. 163-164.

Preview of standards which were approved by the Manufacturing Problems Committee.

17-18. Construction of Basic End and Main Roof for Open-Hearth Furnaces. A. K. Moore. *Proceedings of the National Open Hearth Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers,* v. 31, 1948, p. 164-174; discussion, p. 174-180.

Use of chemically bonded brick, both plated and unplated. Five essential requirements.

17-19. Tests Ceramic Taphole Segment Against Blast Furnace Breakouts. *Steel,* v. 124, Mar. 21, 1949, p. 120, 122.

Proceedings of Chicago District Blast Furnace and Coke Association. Includes pressurized furnace operation; cleaning of coking coal; new coal-blending procedure; Labrador iron-ore deposits.

17-20. Pure Refractory Materials. F. H. Norton. *U. S. Atomic Energy Commission,* AECD-2237, Aug. 25, 1948, 3 pages.

Flow sheet for preparation of CeS, which melts at 2450° C. Comparative thermodynamic properties of a series of stable sulfides, all of which have lower melting points than CeS.

17-21. Investigation of Ceramic, Graphite, and Chrome-Plated Graphite Nozzles on Rocket Engine. George R. Kinney and William G. Lidman. *National Advisory Committee for Aeronautics,* Research Memorandum E8L16, Mar. 7, 1949, 17 pages.

Use of ceramic material for rocket nozzles; effectiveness in preventing oxidation and erosion of graphite nozzles by chromium-plating the internal surface. Estimated combustion-gas temperatures were 2000-2400° F.

17-22. (Book.) **Manual of ASTM Standards on Refractory Materials.** 264 pages. American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. $2.50, paper cover; $3.15, clothbound.

Latest approved form of some 40 ASTM standard and tentative specifications, classifications, methods of testing, and definitions pertaining to refractories. Of the eight specifications, three cover malleable iron furnaces, fireclay, and castable refractories. Procedure for calculating heat losses; practice for use with ASTM panel spalling tests; petrographic techniques; data on standard samples for chemical analysis;

pyrometric-cone equivalent determinations; and industrial surveys of service conditions of refractories are included.

17-23. Gary Steel Works Disintegration Test Equipment. J. A. Shea. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 380. A condensation.

Semi-automatic equipment for making disintegration tests on blast-furnace lining bricks and a suitable test procedure.

17-24. Expansion Effects in Coke-Oven Batteries. *Coke and Gas,* v. 11, Mar. 1949, p. 101-107.

Analyzes the differential expansions that occur during heating up coke-oven batteries constructed in two different types of material, silica and semi-silica.

17-25. Preliminary Investigations Into Coring of Fireclay Refractories. K. W. Cowling and A. Elliott. *Transactions of the British Ceramic Society,* v. 48, Mar. 1949, p. 108-124; discussion, p. 124-131.

Investigation of outbreaks of black-hearting in casting-pit refractories fired in tunnel kilns shows that the major factor affecting this is a change in texture of the ware, leading to decreased porosity and to the formation of a relatively high percentage of closed pores. Causes of this. 14 ref.

17-26. Vergleichsmessungen an zwei Versuchsofen mit verschiedener Ausmauerung. (Comparative Measurements on Two Test Furnaces With Different Linings.) Georg Wagener. *Gas- und Wasserfach,* v. 89, No. 2, 1948, p. 33-36.

Investigation of the relative efficiency of fireclay and light-weight firebrick.

17-27. Erfahrungen in der Herstellung von Huttensteinen. (Experiences in the Production of Refractory Brick.) Paul Huttemann. *Stahl und Eisen,* v. 68, Feb. 26, 1948, p. 85-90.

Some technical problems in the production of refractory brick from foundry slag and foundry sand. Deals in detail with Dresler's ideas on the hardening process with CO_2 and with the factors that influence the strength of refractory brick.

17-28. Properties and Uses of Pure Oxide Heavy Refractories. O. J. Whittemore, Jr. *Industrial Heating,* v. 16, Mar. 1949, p. 496, 498. A condensation.

Physical properties of alumina, magnesia, zirconia, beryllia, and thoria. Recommendations for their use at high temperatures.

17-29. Effect of Oxygen on Refractories in the Basic Open Hearth Furnace. R. S. Moore. *Industrial Heating,* v. 16, Mar. 1949, p. 500, 502. A condensation.

Reaction of some refractories to the use of oxygen, methods of supplying oxygen to the molten bath, merits of super-duty silica brick in the roof, roof suspension, and effect of oxygen on the furnace walls.

17-30. The Preparation of Small Dense Beryllia Crucibles. O. J. Whittemore, Jr. *U. S. Atomic Energy Commission,* AECD-2175, Dec. 1945, 9 pages.

Procedure. Effect of calcination and ball-milling on particle-size and their relation to final crucible properties. Use of "Daxad No. 23" as an anti-sticking agent.

17-31. (Book) **Refractories for Furnaces, Kilns, Retorts, etc. Ed. 2. (Rev.)** Alfred B. Searle. 121 pages. 1948. Crosby Lockwood & Son, Ltd., 20, Tudor Street, London, E.C.4, England.

Characteristics of the chief raw and manufactured refractory materials and the processes and machinery employed in their production. An elementary presentation.

17-32. Undersökningar av krossad kvarts fran Radanefors. (Investigations of Crushed Quartz From Radanefors.) Folke Sandford. *Jernkontorets Annaler,* v. 133, no. 3, 1949, p. 99-124.

The relationship between grain distribution and properties of silica refractories made from above quartz sand when used in acid openhearth furnaces was studied. The effect of grain distribution of the same sand when used in foundry molds for cast steel was also determined.

17-33. Some Effects of Zinc and Carbon Monoxide on Fire-Clay Refractories. R. F. Patrick and R. B. Sosman. *Journal of the American Ceramic Society,* v. 32, Apr. 1, 1949, p. 133-140.

No experimental proof could be obtained that zinc has any disintegrating action on blast-furnace fireclay brick. Zinc and zinc oxide, however, act as mild catalysts for the decomposition of CO to CO_2 and C, a reaction which has been proven, when catalyzed by iron, to be a prime cause of disintegration of fireclay brick. The carbon deposited by the reaction is crystalline graphite. 22 ref.

17-34. Etude sur les oxydes de fer dans la cuisson de la magnésite. (Study of Iron Oxides During Firing of Magnesite.) Otakar Quadrat and Miroslav Beranek. *Collection of Czecho-*

slovak Chemical Communications, v. 14, No. 1-2, 1949, p. 59-65.

Results of experimental investigation indicate that heating of magnesite ore with about 2.5% FeO in the form of $FeCO_3$ at 900-1000° C. in a nitrogen atmosphere effects oxidation of bivalent iron to ferric oxide. A well fired magnesite should not contain Fe_3O_4. For proper firing, all the iron should be in the trivalent form. Generally the remaining Fe_3O_4 is converted into calcium and magnesium ferrites by the action of calcium and magnesium oxides at about 1500° C.

17-35. Blast Furnace Brick Disintegration Test Equipment. J. A. Shea. *Iron and Steel Engineer,* v. 26, Apr. 1949, p. 121. A condensation.

Equipment consists of a gas-tight chamber to hold the test specimens, a suitable furnace, a pump for circulating CO over the specimens, absorption tubes to remove CO_2 and moisture, and a flow meter and pressure gage. Test procedure.

17-36. Properties and Performances of Open Hearth Bottoms. II. (Concluded.) Hobart N. Kraner. *Industrial Heating,* v. 16, Apr. 1949, p. 687-688, 690, 692.

Density and performance of the bottoms; and conclusions reached.

17-37. The Application of Super Refractories to Gas Fired Industrial Kilns and Furnaces. A. A. Turner and J. M. Smith. *American Gas Journal,* v. 170, May 1949, p. 40-41.

Basic types, forms available, and applications.

17-38. Evaluating Adherence of Blue Sheet-Iron Ground Coats. J. L. McLaughlin. *Journal of the American Ceramic Society,* v. 32, May 1, 1949, p. 166-170; *Better Enameling,* v. 20, May 1949, p. 6-7, 22-23, 26-27.

Reflectance measurements were used on sheet-iron plates tested by the drop-hammer impact machine. Results show good correlation with visual estimations of adherence of enamel on steel with and without nickel flashing.

17-39. The Properties of Olivine and Its Uses for Refractories and Moulding Sands. Kristoffer Johannes Stenvik. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 44-48.

Details of investigations, and the properties of forsterite are compared with those of other refractory materials. Experiments have also been made on olivine as a molding sand. It has a number of technical advantages over quartz, and it appears from animal tests that little or no silicosis hazard is involved.

17-40. Steel Mill Refractories and Masonry. *Industrial Heating,* v. 16, May 1949, p. 876, 878, 880, 882, 884.

Proceedings of session on above subject at 31st conference of National Open Hearth Steel Committee, and Blast Furnace, Coke Oven and Raw Materials Committee of AIME, Pittsburgh.

17-41. Study of a Slagged High Alumina Fire Brick. W. A. Lamberton. *Industrial Heating,* v. 16, May 1949, p. 886, 888.

From a naval boiler. The brick was cut into ten sections, from hot to cold end, and examined chemically, spectrographically, and by means of the X-ray, along with a control sample from an unused brick.

17-42. Some Factors Affecting Spalling of Fireclay Bricks. C. E. Moore. *Transactions of the British Ceramic Society,* v. 48, May 1949, p. 176-183; discussion, p. 183-185.

Review. Possible methods of overcoming this defect and lines of research.

17-43. Refractory Concrete. A. E. Williams. *Engineer,* v. 187, May 6, 1949, p. 496-498.

Its performance and applications.

17-44. Basische Zustellung fur Elektroöfendeckel. (Basic Linings for Electric Furnace Covers.) Robert Klesper *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 241-243.

Different types of basic lining, including sillimanite, magnesite, and fireclay brick. Temperature expansion curves.

17-45. Uber stabile Dolomitsteine. (Concerning Stable Dolomite Bricks.) Kurd Endell. *Stahl und Eisen,* v. 66-67, Aug. 14, 1947, p. 290-293.

Methods of stabilizing calcium orthosilicate. Results of determination of the mineralogical and chemical structure of several test bricks. 10 ref.

17-46. Alte und neue Bindemittel aus Hochofenschlacke. (Old and New Binders Made From Blast Furnace Slag.) Fritz Keil. *Stahl und Eisen,* v. 66-67, Dec. 4, 1947, p. 416-420.

Binding media in cements, mixed binders, and hydraulic limes; the development, properties and uses of mixed binders, slag binders, and gypsum slag cements. 18 ref.

17-47. Fours sidérurgiques construits en pisé de silice. (Metallurgical Furnaces With Silica Linings.) Antonio Scortecci and Francisco Savioli. *Revue de Métallurgie,* v. 46, Mar. 1949, p. 141-146; discussion, p. 146.

Composition and method of production of lining. Technique of application in different parts of the

furnace. Mechanical properties and wear are compared with those of other commonly used lining materials.

17-48. Petrographic Characteristics of Basic Chrome-Magnesite Refractories. (In Russian.) D. S. Belyankin and B. V. Ivanov. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 51-58.

The mechanical properties as applied to linings for blast and other metallurgical furnaces at temperatures up to 2000° C. The low thermal stability and low temperature (1450-1550° C.) of the beginning deformation under stress. The mechanism of destruction of chrome-magnesite refractories is established and recommendations are made to obviate this disadvantage, mostly by changes in chemical composition.

17-49. Process of Production of High-Alumina Refractories on the Basis of the Synthesis of Mullite. (In Russian.) D. N. Poluboyarinov and R. Ya. Popil'skii. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 58-64.

Investigation led to establishment of basic conditions of production for refractories containing up to 60% Al_2O_3. Individual factors affecting heat resistance of these refractories. Applications.

17-50. Refractory Concretes With Increased Heat Resistance. (In Russian.) G. V. Kukolev and A. I. Roizen. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 65-76.

Proposes the use of heat resistant concretes containing alumina cement at temperatures up to 1250° C. Optimum compositions. Mechanical properties. Sphere of application.

17-51. Production of Dinas Bricks for the Crowns of Open-Hearth Furnaces. (In Russian.) Yu. P. Sidorenko and K. K. Tomash. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 77-84.

Method of production used in the USSR. Different factors involved and their influence on the quality of the final product. Optimum chemical compositions and conditions of production.

17-52. Problem of Wear of Heat Resisting Chrome-Magnesite in Crowns of Electric-Arc Steel Furnaces. (In Russian.) A. T. Kleinberg. *Ogneupory* (Refractories), v. 14, Feb. 1949, p. 85-90.

Changes undergone by heat-resisting chrome-magnesite during its service in above furnaces. Test specimens from the crowns of 4.5 and 15-ton electric furnaces. Factors increasing the life of these refractories.

17-53. The Preparation of Small Dense Thoria Crucibles. O. J. Whittemore, Jr. *U. S. Atomic Energy Commission,* AECD-2187, Dec. 1945, 5 pages.

Method using 2% zirconia as a flux. Crucibles are pressed from a composition containing a water-soluble wax as an internal body lubricant. Wax is then burned out and crucibles fired to 1800° C.

17-54. (Book) **The Thin-Section Mineralogy of Ceramic Materials.** G. R. Rigby. 179 pages. 1948. British Refractories Research Assoc., London, England.

Preparation of thin sections, identification of mineral phases, and optical properties of minerals found in ceramic materials, slags, glasses, and sinters. 56 ref.

17-55. Note on the Preparation of Small Dense Beryllia Crucibles. Helen B. Barlett. *U. S. Atomic Energy Commission,* AECD-2170, Aug. 1945, 3 pages.

Method consists of hot pressing beryllia containing a thermal-setting, phenol-formaldehyde resin; carefully oxidizing the resin; and firing in a small alumina kiln to about 1800° C.

17-56. The Oxidation of Silicon-Carbide Refractory Materials. A. C. Lea. *Journal of the Society of Glass Technology,* v. 33 (Transactions Section), Feb. 1949, p. 27-50.

Rate of oxidation of silicon-carbide grain and of silicon-carbide refractory in various atmospheres. The influence of steam in accelerating the speed of oxidation, and possible reasons for this effect.

17-57. Properties of Refractory Materials. S. M. Phelps. *American Foundryman,* v. 15, June 1949, p. 58-59.

Properties for 19 materials. Factors connected with slag effects.

17-58. Mechanism of Erosion of Nozzles in Open-Hearth Ladles. R. B. Snow and James A. Shea. *Journal of the American Ceramic Society,* v. 32, June 1, 1949, p. 187-194.

Experiments made with removable nozzle extensions to determine the relative amount of erosion when various types of steel are teemed through regular fire-clay nozzles fired to different temperatures and nozzles of the more refractory types.

17-59. Die Strahlungseigenschaften von feuerfesten Steinen und Schlacken und deren Einfluss auf den Wärmeubergang. (The Radiating Properties of Refractory Bricks and Slags and Their Effect on Heat Transfer.)

Gerhard Naeser and Werner Pepperhoff. *Stahl und Eisen,* v. 69, May 12, 1949, p. 325-328.

Role in the openhearth. The amounts of reflected heat from luminous and nonluminous flames were measured and it was found that heavy-metal oxides greatly increase the reflection of nonluminous flames.

17-60. Die Silikamörtel, ihre Anwendung und Prufung. (Silica Mortar, Its Use and Testing.) Hubert Grewe and Fritz Harders. *Stahl und Eisen,* v. 69, May 26, 1949, p. 378-381.

An illustrated discussion based on the literature (mostly German) of the past 25 years.

17-61. Basic Refractories; Their Chemistry in Relation to Their Performance. J. R. Rait. *Iron and Steel,* v. 22, May 12, 1949, p. 187-193; June 1949, p. 289-293.

Phase constitution and transformations; properties; performance under various conditions, etc. 63 ref. (To be continued.)

17-62. Maintenance of Furnace and Soaking Pit Hearths. *Industrial Heating,* v. 16, June 1949, p. 1067-1068. Condensed from "The Maintenance of Hearths in Heating Furnaces and Soaking Pits," by Charles N. Jewart.

Various types of hearth material, and experience with an installation composed of different combinations of basic refractories, each in its own section, in order to determine the most satisfactory material.

17-63. Higher Temperature Refractories. Goal of New Research Laboratory. Dan Reebel. *Steel,* v. 125, July 11, 1949, p. 84-86.

Programs of General Refractories Co. laboratory in Baltimore which include the development of the all-basic openhearth furnace and necessary auxiliary processes; also investigations concerned with higher temperature refractories.

17-64. Facteurs d'émission des produits réfractaires silico-alumineux a haute température. (Emission Factors of Silica-Alumina Refractory Materials at High Temperatures.) Marcel Michaud. *Comptes Rendus* (France), v. 228, Mar. 28, 1949, p. 1115-1116.

Factors of monochromatic emission of refractory oxides from 1000 to 1600° C. were investigated. It was established that the size of grains and the traces of iron oxide are the main factors in variation of the above factors. Chemical composition of the materials seems to have only a slight influence.

17-65. Forsterit als "basisches" Futter fur grosse Hochfrequenzöfen. (Forsterite as Basic Lining for Large High-Frequency Furnaces.) Helmut Stutzel. *Stahl und Eisen,* v. 69, June 9, 1949, p. 403-405.

Various refractory linings, and production of forsterite ($MgSiO_4$). Experiments showed advantages of this material over other linings.

17-66. Effect of Oxygen on Refractories in the Basic Open Hearth. R. S. Moore. *Iron and Steel Engineer,* v. 26, July 1949, p. 47-50; discussion p. 50.

Previously abstracted from condensation in *Industrial Heating.* See item 17-29, 1949.

17-67. Assessment of the Resistance of Refractory Materials to Sudden Temperature Variations. A. Giannone. *Engineers' Digest,* v. 10, June 1949, p. 189-192. Translated and condensed from *Il Calore,* v. 19, Nov. 1948, p. 398-401.

Develops a graphical method for the determination of the stresses acting in a plane wall of infinite length. Known factors are: temperatures occurring at various distances within the wall at a given instant; mean value of coefficient of thermal expansion; modulus of elasticity; and rupture strength of the material.

17-68. Factors in Service Behavior of Silica Brick. L. A. Smith. "Yearbook of the American Iron and Steel Institute, 1948", p. 392-405; discussion, p. 405-414.

Previously abstracted from *Blast Furnace and Steel Plant,* item 17-59, 1948.

17-69. Basic Brick in the Open Hearth Furnace. Vernon W. Jones. "Yearbook of the American Iron and Steel Institute, 1948", p. 415-424; discussion, p. 425-428.

Previously abstracted from *Blast Furnace and Steel Plant,* item 17-68, 1948.

17-70. Properties and Performance of Open Hearth Bottoms. H. M. Kraner. "Yearbook of the American Iron and Steel Institute, 1948", p. 429-451; discussion, p. 452-457.

Previously abstracted from *Industrial Heating,* item 17-14 and 17-36, 1949.

17-71. Some Considerations in the Use of Carbon Refractories in Blast Furnaces. W. S. Debenham. "Yearbook of the American Iron and Steel Institute, 1948", p. 458-474.

Previously abstracted from *Steel,* item 17-67, 1948.

17-72. Operating Properties of Crown Dinas Brick (Physico-Chemical Factors Determining Ability of Dinas

Brick to Expand During Firing of an Openhearth Furnace). (In Russian.) I. S. Kainarskii and V. D. Tsigler. *Ogneupory* (Refractories), v. 14, Mar. 1949, p. 125-136.

Factors affecting the workability of Dinas brick when used in the crown of a furnace. The ability to expand during heating is the most important quality for proper functioning and durability. Optimum chemical compositions. Comparative data for different types. 23 ref.

17-73. A Study of Silica Refractories by Torsion Methods. S. S. Das and A. L. Roberts. *Transactions of The British Ceramic Society,* v. 48, July 1949, p. 215-228; discussion, p. 228-234.

Torsion tests on two types of commercial silica refractories up to 1620° C. showed that pronounced changes occurred in mechanical properties on heating. Results emphasize the characteristically high load-bearing capacity of silica and point to a unique relationship between crystals and matrix, which needs further exploration. They also suggest that silica is most liable to spall at temperatures somewhat below the cristobalite inversion range.

17-74. Chemical Changes in Basic Brick During Service. T. F. Berry, W. C. Allen, and R. B. Snow. *Industrial Heating,* v. 16, July 1949, p. 1254, 1256. A condensation.

The influence of the diffusion of iron oxide into the periclase crystals adjacent to the hot face of basic brick during service in an openhearth furnace, and subsequent growth of these crystals, is believed to have a greater influence upon the peeling of the hot face than the growth of the original chrome crystals.

17-75. Disintegration Test Equipment for Refractories. J. A. Shea. *Industrial Heating,* v. 16, July 1949, p. 1262, 1264. A condensation.

Previously abstracted from *Iron and Steel Engineer,* item 17-35, 1949.

17-76. Blast Furnace Brick Disintegration Test Equipment and Test Procedure. J. A. Shea. *American Ceramic Society Bulletin,* v. 28, July 15, 1949, p. 253-259.

Semiautomatic equipment and procedure. Essentially, the equipment consists of a gas-tight chamber to hold the test specimens, a suitable furnace for heating the chamber, a pump for circulating CO over the specimens in a closed system, absorption tubes to remove CO_2 and moisture from the circulating gas, and a flowmeter and pressure gage. The brick specimens are heated to 950° F. and then exposed to the action of a 20 cu. ft. per hr. flow of CO for 40 hours.

17-77. Physical Properties at Elevated Temperature of Seven Hot-Pressed Ceramics. James J. Gangler, Chester F. Robards, and James E. McNutt. *National Advisory Committee for Aeronautics,* Technical Note 1911, July 1949, 33 pages.

Investigation to determine elevated temperature, short-time tensile strength, relative resistance to thermal shock, coefficient of thermal expansion, and density. Includes B_4C, TiC, ZrC, 85% SiC plus 15% B_4C, zircon, and stabilized zirconia. TiC was the most promising for possible gas-turbine application because of high tensile strength at elevated temperatures and superior resistance to thermal shock. 11 ref.

17-78. High Temperature Properties of Magnesia Refractories. J. C. Hicks and Ben Davies. *Iron Age,* v. 164, Aug. 11, 1949, p. 98-105, 157-158.

Prolonged exposure of a high-purity magnesia refractory to 3800° F. produces significant changes in chemical and mineralogical character and in physical and thermal properties. A detailed analysis of these changes, correlating quantitative physical and thermal property data.

17-79. Good Refractories + Proper Use = Improved Performance. Frank A. Czapski. *American Foundryman,* v. 16, Aug. 1949, p. 54-55.

Recommended refractories for specific locations in the foundry and proper procedures of use.

17-80. Carbon Linings for Blast Furnaces. J. H. Chesters and G. D. Elliot. *Iron Age,* v. 164, Aug. 18, 1949, p. 89-97.

Experiences in Great Britain. Various successful construction techniques. Relative characteristics of carbon bricks and conventional blast-furnaces refractories. 19 ref.

17-81. Chemical Changes in Basic Brick During Service. T. F. Berry, W. C. Allen, and R. B. Snow. *Blast Furnace and Steel Plant,* v. 37, Aug. 1949, p. 996. A condensation.

Previously abstracted from *Industrial Heating.* See item 17-74, 1949.

17-82. Basic Brick in the Open Hearth Furnace. Vernon W. Jones. *Industrial Heating,* v. 16, Aug. 1949, p. 1441-1442, 1444, 1446, 1448, 1450.

Advantages and operational experience and data on the use of magnesite and chrome-magnesia brick in the hearth; steel-clad magnesite in the frontwalls, endwalls, backwalls, and bulkheads; and subsequent use

of suspended construction for basic roofs and all-basic furnaces.

17-83. Steel-Tight Linings for Basic Induction Furnaces. J. H. Chesters, L. Lee, and J. Mackenzie. *Transactions of the British Ceramic Society,* v. 48, Aug. 1949, p. 263-287; discussion, p. 287-290.

Principles involved in maintaining steel tightness in refractory linings with particular reference to induction furnace steelmaking. Several basic lining compositions. Development work to produce a monolithic lining from sea-water magnesia that would show permanent expansion in intermediate temperature ranges. The most satisfactory results were obtained with additions of 4% sand and 2% borax to magnesia. Some available commercial linings, their installation and maintenance. Control charts for grading, low-temperature expansion at 1150° C. and high-temperature shrinkage. 23 ref.

17-84. Beitrag zum Verhalten von Graphit und Kohlenstoff in Schamottewerkstoffen. (The Behavior of Graphite and Carbon in Refractory Materials.) Fritz Harders and Hubert Grewe. *Stahl und Eisen,* v. 69, July 21, 1949, p. 519-523.

Carbon, primarily in the form of graphite, can be embedded in refractory materials by treatment at 1000-1200° C. in a stream of coke-oven gas. A carbon content of 1.5-2.0% considerably improves the heat resistance of the refractory material under pressure and decreases its tendency to adhesion, but does not affect its resistance to slagging. An improved method of testing for heat resistance under pressure.

17-85. O zhotoveni kysele vyzdivky vysokofrekvencni pece na taveni oceli a o jeji trvanlivosti. (The Preparation of an Acid Lining of a High-Frequency, Steel-Melting Furnace and Its Performance.) Jan Kulhánek. *Hutnické Listy,* v. 4, Apr. 1949, p. 101-104.

For a 2½-ton furnace. Types of steels that may be prepared, life of lining, current consumption.

17-86. Refractory Practice in the Whiting-Cole Recirculating Annealing Oven. Ray A. Witschey. *Foundry,* v. 77, Sept. 1949, p. 80-83, 244-245.

Choice of suitable refractories for different parts of the furnace, and methods for their installation.

17-87. Hydraulic Activity of Granular Slags. (In Russian.) N. A. Toropov and B. V. Volkonskii. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, May 1, 1949, p. 95-97.

Influence of the vitreous component of granular blast-furnace slags on the properties of slag cements. Activity of the slags is determined by chemical composition and by the composition ratio of vitreous and crystalline components, which may vary over a wide range.

17-88. Refractories. Their Selection and Specification. B. L. Majumder and M. A. Ghain. *Refractories Journal,* Aug. 1949, p. 265-267, 269-273.

Discussed from the standpoint of properties.

17-89. Laboratory, Now in Service, Combines Testing of Refractories With Research. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 37, Sept. 1949, p. 1078-1080.

New laboratory of the General Refractories Co.

17-90. Basic Brick in the Open Hearth Furnace: II. (Concluded.) Vernon W. Jones. *Industrial Heating,* v. 16, Sept. 1949, p. 1626, 1628, 1630.

Suspended construction, removal of deposits in slag pockets without the use of dynamite, gains made in the use of basic brick above the hearth, and possible future applications.

17-91. The Properties and Uses of Pyrometric Cones — Orton Standard Pyrometric Cones. *Edward Orton, Jr., Ceramic Foundation* (Columbus, Ohio). Apr. 1949. 55 pages.

The Orton cone series, temperature, equivalents, and use.

17-92. Testing Refractories for the Foundry. S. M. Swain. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 208-221; discussion, p. 221-222.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-26. See item 17-37, 1948.

17-93. Refractories Used in Steel and Iron Foundries. W. H. Owen. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 342-344; discussion, p. 344.

A general discussion of types and applications.

17-94. Refractory Materials in the Foundry Industry. G. R. Rigby and A. T. Green. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. A144-A150; discussion, p. A150-A151.

Previously abstracted from *Foundry Trade Journal.* See item 17-84, 1948.

17-95. Strahlung Feuerfester Stoffe. (Radiation of Refractory Materials.) C. A. Landfermann. *Chemie-Ingenieur-Technik,* v. 21, Aug. 1949, p. 295-297.

Uses recent research data to indicate quantitatively the frequency dependence of the radiation of refractory materials; in the short wavelength range, radiation can be materially increased by the addition of metallic oxides. 11 ref.

17-96. Modern Refractories Give New Operating Economies. R. P. Heuer and M. A. Fay. *Iron Age,* v. 164, Oct. 6, 1949, p. 82-85; Oct. 13, 1949, p. 86-90.

The suitability of silica, sillimanite, basic, and carbon refractories for various blast-furnace uses appraised from the standpoint of cost considerations and metallurgical characteristics in the first installment. In the concluding part, developments in refractories for openhearth furnaces and mixers, soaking pits, and forging furnaces, and economies relating to the all-basic furnace. Also includes a listing of basic-end openhearth installations in the U. S. and Canada.

17-97. (Book) **Better Refractories for the Furnaces of Industry.** 168 pages. 1949. Mexico Refractories Co., Mexico, Mo.

Story of the Mexico Refractories Co. Firebrick products, standard shapes, specialty products, exports, and technical data.

17-98. (Book) **Refractories.** 272 pages. 1949. General Refractories Co., 1520 Locust St., Philadelphia 2, Pa. $5.00.

A handbook of information for consumers, designers and builders of refractory equipment. History of refractories, manufacture of refractory brick, and their properties and behavior. Lists industries that use refractories and provides a general guide to selection of refractories best suited for particular cases.

17-99. Methods of Analyzing Refractory Consumption. William A. Greene. *Blast Furnace and Steel Plant,* v. 37, Oct. 1949, p. 1199-1204.

Various methods of determining openhearth masonry cost per ingot net ton.

17-100. Experiments With Small Ingots of Rimming Steel. D. Binnie. *Journal of the Iron and Steel Institute,* v. 163, Oct. 1949, p. 159-167.

Ingots up to 300-lb. weight were teemed into hematite molds, copper molds, and into molds partially lined or fully lined with refractory material in order to compare the effect of chill and refractory lining on rimming action. Chemical analysis shows that the refractory-lined mold is superior to the iron mold in general use.

17-101. The Growth of Periclase Crystals and Its Importance in Basic Refractories. E. B. Colegrave, H. M. Richardson, and G. R. Rigby. *Discussions of the Faraday Society,* No. 5 (Crystal Growth), 1949, p. 352-357.

The magnesia used in "magnesite" bricks or blocks is commonly preheated or "dead-burned" prior to forming into shapes in order to prevent excessive shrinkage and tendency toward hydration. Certain impurities, naturally present or added, facilitate the process. Reviews the literature and presents new experimental observations on the structural features of magnesite before and after dead burning, including effects of temperature and impurities. Effects of growth of periclase crystals on volume shrinkage, true specific gravity, and hydration tendency.

17-102. Étude du comportement des briques de chrome-magnésie constituant les voutes des fours électriques. (Problem of Wear of Heat-Resisting Chrome-Magnesite in Crowns of Electric-Arc Steel Furnaces.) A. T. Kleinberg. *Circulaire d'Informations Techniques,* v. 6, Apr.-May 1949, p. 175-178.

Previously abstracted from *Ogneupory* (Refractories). See item 17-52, 1949.

17-103. Progress Review No. 1: The Properties of Refractories. A. E. Dodd. *Journal of the Institute of Fuel,* v. 22, Oct. 1949, p. 361-364.

Developments since 1945. 41 ref.

17-104. Apparatus for Determination of Thermal Resistance of Dinas Brick for Coke Ovens. (In Russian.) I. S. Kainarskii and I. S. Smelyanskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 873-876.

The apparatus applicable to service conditions of coke-oven charging-door caps and for evaluation of the heat resistance of Dinas brick for hearths of coke-oven chambers.

17-105. Operating Characteristics of Crown Dinas Brick (Influence of Absorption of Ferric Oxide by Dinas Brick on Its Tendency to Form Filaments During Overheating). (In Russian.) I. S. Kainarskii and V. D. Tsigler. *Ogneupory* (Refractories), v. 14, July 1949, p. 293-297.

It was found experimentally that the above tendency of Dinas brick decreases as a result of absorption of Fe_2O_3. Optimum conditions for use in the crowns of openhearth furnaces.

17-106. Notch Sensitivity and Low-Temperature Spalling of Fire-Clay Refractories. Ralph Rose and R. S. Bradley. *Journal of the American Ceramic Society,* v. 32, Nov. 1, 1949, p. 360-362.

Attempts were made to correlate

physical properties of fireclay refractories with low-temperature spalling. A method of considerable promise was developed. No purely mathematical relationship appeared to be valid.

17-107. Furnace Bottom Installed in 57 Hours in World's Largest Open-Hearth. H. N. Barrett. *Steel,* v. 125, Nov. 28, 1949, p. 56-58.

Bottom installation in Weirton Steel's 550-ton furnace. A rammed bottom was used. Pros and cons of the full rammed hearth and the subhearth with a "burned-up" top layer.

17-108. Specialties Solve Many Refractories Problems. F. W. Schroeder. *Refractories Journal,* v. 25, Oct. 1949, p. 346-350. Reprinted from *Modern Power and Engineering.*

Applications of so-called special refractories.

17-109. Basic Refractories; Their Chemistry in Relation to Their Performance. (Continued.) J. R. Rait. *Iron and Steel,* v. 22, Nov. 1949, p. 493-498.

Reviews the literature on the systems $CaO-SiO_2-Al_2O_3$; $CaO-SiO_2-Fe_2O_3$; $CaO-Al_2O_3-Fe_2O_3$; $CaO-Al_2O_3-SiO_2-Fe_2O_3$; $CaO-MgO-SiO_2-Al_2O_3$; $CaO-MgO-Al_2O_3-Fe_2O_3$; and $CaO-MgO-SiO_2-Al_2O_3-Fe_2O_3$. X-ray and microscopic investigations of the same system. 30 ref.

17-110. Refractories Cost Money Too. *Engineering and Mining Journal,* v. 150, Dec. 1949, p. 74-77.

Properties and economics of the various types of furnace refractories, with emphasis on their use in smelting operations.

17-111. Suggestions for a Glossary of Terms Relating to Refractories, Their Manufacture and Use. S. M. Phelps. *American Refractories Institute,* Technical Bulletin, No. 87, Oct. 1949, 19 pages.

17-112. Cupola Refractories; A Review of the Literature. W. A. Archibald. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 515-518.

71 references.

17-113. Étude des ciments pour mélangeurs à base d'oxychlorures et d'oxysulfates de magnésie. (Study of Oxychloride and Oxysulfate-Base Binders.) Paul Rocquet. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 639-644.

The wear and abrasion resistance of the above materials were investigated in order to determine their respective suitabilities for joining refractory bricks or blocks used in metallurgical furnaces.

SECTION XVIII

HEAT TREATMENT

18A—General

18A-1. Which Atmosphere for Heat Treating and Brazing? C. E. Peck. *American Machinist,* v. 93, Jan. 13, 1949, p. 90-94.

Eight representative controlled atmospheres for furnaces are discussed with respect to compositions, properties, and specific applications.

18A-2. Gas Generators for Controlled Atmospheres. W. H. Holcroft and M. R. Larson. *Steel,* v. 124, Jan. 24, 1949, p. 54-55.

18A-3. Chemical Analysis of Heat Treating Salts. Part II. (Concluded.) Vincent C. Petrillo. *Steel Processing,* v. 35, Jan. 1949, p. 37-43.

Methods developed for chemically determining fluorides qualitatively in Classes A, B, and C salt-bath mixtures, and pH ranges, moisture and sulfates in all four classes. Class A consists of potassium nitrate, sodium nitrite, and sodium nitrate; B, of potassium nitrate and sodium nitrate; C, of sodium chloride and potassium chloride; and D, of barium chloride and silica. 11 ref.

18A-4. Heat-Treating Department Planned for Quality Control and Cleanliness. John H. Fisher. *Machinery* (American), v. 55, Feb. 1949, p. 166-169.

Department at Landis Tool Co., Waynesboro, Pa.

18A-5. Some Aspects of Internal Oxidation in Ag, Cu, Ni and Fe-Alloys. J. L. Meijering. "Pittsburgh International Conference on Surface Reactions", 1948, p. 101-104.

Results of investigation of the possibility of hardening alloys by diffusion of oxygen into their solid solutions with small percentages of other elements having sufficient affinity for oxygen. The hardness of an alloy of Ag + 0.3% Mg was raised over 400% by heating in air at 800° C. for 2 hr. Oxidative hardening of Cu was promoted by alloying with Be, Mg, Al, or Ti. Of the Ni alloys, only Al gave important hardening effects; and all the solute metals tried with Fe were practically ineffective. (See also 4C-28, 1949.)

18A-6. Tempering in a Steam Atmosphere. Hal M. Parshall. *Machinery* (American), v. 55, Mar. 1949, p. 150-153.

Longer tool life, improved machinability of both ferrous and nonferrous parts, and increased hardness of powdered-iron parts are some of the advantages claimed for use of steam atmospheres in heat treating furnaces. Equipment and procedures.

18A-7. Age-Hardening. Marie L. V. Gayler. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 255-264; discussion, p. 432-462.

Reviews theories of age-hardening proposed during the past 26 yrs. Recent metallographic analyses have led to the deduction that highly localized stresses are formed within the lattice during the process of age-hardening, on a sub-microscopic as well as on a microscopic scale. 38 ref.

18A-8. Production Line Heat Treating. H. M. Heyn. *Industrial Gas,* v. 27, Mar. 1949, p. 5-7, 24.

By "barrel carburization" many parts previously carburized in batch or continuous furnaces may now be carburized in "barrels" in much the same way as barrels are used for cleaning and electroplating. Parts are heated, carburized, quenched, washed, reheated, quenched and drawn by a continuous method.

18A-9. Planung und Betriebswirtschaft in der Wärmebehandlung. (Planning and Economy of Heat Treating Operations.) Helmut Schneider. *Stahl*

und Eisen, v. 68, Dec. 2, 1948, p. 479-481.

How to plan and perform heat treating operations with a high degree of efficiency; how to calculate the cost of heat treating.

18A-10. Aus der Praxis der autogenen Oberflächen-härtung. (Practical Flame Hardening.) B. F. Gorthon. *Zeitschrift fur Schweisstechnik; Journal de la Soudure,* v. 39, Feb. 1949, p. 29-33.

Different types of flame-hardening machines. Composition of steel suitable for flame hardening and the range of application of the three most important flame-hardening processes. Strength properties.

18A-11. Der Einfluss der Wärmebehandlung auf die Härte und die Gasgehalte der Hartchromschichten. (The Effect of Heat Treating on the Hardness and Gas Content of Hard Chromium Deposits.) Walter Eilender, Heinrich Arend, and Eugen Schmidtmann. *Metalloberfläche,* v. 2, July 1948, p. 143-145.

Studies show that hardness and hydrogen content decrease with increasing temperature, that no heat treating operation can alter the oxygen content of the Cr, and that hardness drops with heat treating time at a decreasing rate. 12 ref.

18A-12. How to Handle Parts in Induction Heating. Clarence E. Glick and Roger E. Harlepp. *American Machinist,* v. 93, Apr. 7, 1949, p. 92-96.

Typical fixtures designed for heat treating, soldering, brazing, forging, and shrink-fitting illustrate basic principles.

18A-13. Controlled Atmospheres. *Journal of the Birmingham Metallurgical Society,* v. 28, Dec. 1948, p. 281-295; discussion, p. 296-304.

Extended remarks by P. F. Hancock dealing mainly with actual plant practice and by R. Whitfield on chemical and metallurgical aspects, followed by a general discussion.

18A-14. Die autogene Oberflächenhärtung; La trempe superficielle au chalumeau. (Flame Hardening.) H. Bauer. *Zeitschrift fur Schweisstechnik; Journal de la Soudure,* v. 39, Feb. 1949, p. 21-28.

Physical principles and advantages. Spot hardening, case hardening, line hardening, and annular hardening methods of carbon and alloy steels. (To be continued.)

18A-15. Effect of Contamination on Quenching Media. Howard E. Boyer. *Iron Age,* v. 163, May 5, 1949, p. 88-91, 100.

Results of a study of the influence of contamination on the efficiency of oil quenching media, in which the end-quench hardenability test was used in reverse. Effect of water contamination in oil, as compared with conventional oil and water quenching methods. Some notes on the influence of media temperature on quenching power.

18A-16. Problems in Heat Treating. Howard E. Boyer. *Steel Processing,* v. 35, Apr. 1949, p. 203-206, 215.

Causes and cures for cracking. (To be continued.)

18A-17. Liquid Salt Baths. I. J. A. McElgin. *Canadian Metals and Metallurgical Industries,* v. 12, Apr. 1949, p. 14-15, 37-42.

Applications to a wide variety of heat treating problems. (To be continued.)

18A-18. Steam Atmosphere Used to Heat Treat and Improve Surface Properties. F. L. Spangler. *Materials & Methods,* v. 29, May 1949, p. 56-58.

Methods by which many ferrous and nonferrous materials can be processed at temperatures up to 1000° F. in steam atmospheres to produce a thin, clean, and tenacious oxide film.

18A-19. Compact, Versatile Heat Treating Shop of Cincinnati Shaper Co. *Industrial Heating,* v. 16, May 1949, p. 808, 810, 812, 814, 816, 822.

18A-20. A Simple Laboratory Test to Determine Data Necessary for the Production Heat-Treatment Process. James Mowat and John Sloan. *Journal of the West of Scotland Iron and Steel Institute,* v. 55, 1947-48, p. 141-160; discussion, p. 160-175.

"Refining Bar Test", so designed that practical information regarding heat treatment, range of hardness, ductility, and structure expected can be obtained. It consists of subjecting two standard bars, in different heat treated conditions, to a heat gradient in a specially designed furnace. Results are given in the form of graphs indicating the relation between Brinell hardness and the temperature from which the steel has been quenched subsequent to annealing treatment and at which it has been tempered after a previous hardening treatment.

18A-21. (Book) **La pratique des Traitements Thermiques des Métaux Industriels.** (Practical Heat Treatment of Commercial Metals.) Ed. 3. Gérard de Smet. 320 pages. 1949. Dunod, 92 rue Bonaparte, Paris 6, France.

Methods of production, chemical

composition, and physical and chemical properties of metals and alloys, practical and simply presented methods and equipment for heat treatment. Theoretical aspects are largely omitted. A chapter on mechanical testing is appended.

18A-22. (Book) **Metal Working and Heat-Treatment Manual. Vol. III.** F. Johnson. 185 pages. Paul Elek Publishers, Ltd., 38 Hatton Garden, London, E. C. 1, England. 21s. net.

Carburizing processes indicating their applicability to specific types of steel. Gas carburizing and the cyanide process, nitriding, flame hardening, and induction hardening. Furnace atmospheres and surface protection during heat treatment of both ferrous and nonferrous metals.

18A-23. Selective Surface Hardening With Flamatic Hardening Machine. William F. Schleicher. *Machine and Tool Blue Book,* v. 45, July 1949, p. 83-86, 88.

Machine provides electronic temperature control of surface hardness and depth of heat penetration. Heating cycle can be raised 500° F. in 1 sec., and flame temperatures up to 6200° F. are possible.

18A-24. Tempering in a Steam Atmosphere. H. M. Parshall. *Machinery* (London), v. 74, June 23, 1949, p. 844-846.

Technique and equipment for both ferrous and nonferrous metals. Increased tool life, reduction of scale formation, and treatment of powdered metal parts.

18A-25. Planned Heat Treating. *Canadian Metals and Metallurgical Industries,* v. 12, July 1949, p. 12-13, 32-33.

For cutting tools.

18A-26. Heat Treating: Hot Prospect for Cold-Cash Savings. *Modern Industry,* v. 18, July 15, 1949, p. 54-56, 58, 60, 62, 64.

New methods and equipment and their applications.

18A-27. The Manufacture of Springs With Low Thermal Coefficients of the Modulus of Elasticity. Stephan Thyssen-Bornemisza. *Microtechnic* (English Edition), v. 3, May-June 1949, p. 129-133. Translated from the German.

Object of spring treatment. Methods used for influencing the thermal coefficient of the modulus of elasticity. (To be continued.)

18A-28. Das Abkühlungsvermögen flüssiger Härtemittel. (The Cooling Effect of Liquid Hardening Agents.) Walter Peter. *Archiv für das Eisenhüttenwesen,* v, 20, July-Aug. 1949, p. 263-274.

The quenching properties of water, oils, aqueous salt solutions, and metal and salt baths were investigated by the silver-sphere method. Differences in the quenching properties of water were found to be caused by their variable contents of different gases and inorganic compounds. Quenching properties of the other media can be varied greatly by change of temperature, composition, etc. 20 ref.

18A-29. Die Wärm-Elektrode, ein neues Hilfsmittel zur örtlichen Wärmebehandlung und Erwärmung. (The Heating Electrode, a New Means of Local Heat Treating and Heating.) H. Schottky and F. H. Müller. *Schweissen und Schneiden,* v. 1, May 1949, p. 78-81.

A patented electrode which, upon heating, is converted into slag and thus merely heats the metal to which applied. Principles and procedures.

18A-30. Verbesserung der Haftfähigkeit von Nickel- und Hartchromschichten und der Wechselfestigkeit vernickelter und verchromter Teile durch Wärmebehandlung. (Increasing the Adhesivity of Nickel and Hard-Chromium Plating and the Fatigue Strength of Nickel and Chromium-Plated Parts by Heat Treatment.) K. Wellinger and E. Keil. *Metalloberflache,* v. 2, Nov. 1948, p. 233-236.

Good results for such treatment. Photographs show the type of bars used for testing.

18A-31. Hardening, Brazing Simplified by Induction Heating Method. *Western Metals,* v. 7, Sept. 1949, p. 37-38.

Principle is radically different from conventional practices. High-frequency electric current is generated in a converter and transmitted to the work through water-cooled coil-copper tubing with one or more turns. The "shorted turn" principle sets up a heating resistance.

18A-32. Untersuchung der Abkühlungswirkung von Kühlmitteln mit dem Kathodenstrahloszillographen. (Investigating the Cooling Effects of Quenching Agents With the Cathode Ray Oscillograph.) H. Te Gude. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 311-312.

Equipment and procedure. Results for four different oils.

18A-33. The Manufacture of Springs With Low Thermal Coefficients of the Modulus of Elasticity. (Concluded.) Thyssen-Bornemisza. *Microtecnic* (English Edition), v. 3. July-Aug. 1949, p. 159-164. Translated from the German.

Annealing of Cr, Cu, and Ni plating to produce low thermal coefficients; and reduction of the elastic after-effect by aging. Manufacturing process for precision springs; variation of modulus of elasticity with temperature for various compositions.

18A-34. The Physical Basis of Heat Treatment. B. Chalmers. *Canadian Metals and Metallurgical Industries,* v. 12, Oct. 1949, p. 12-15.

Second of a series of lectures on fundamentals of metalworking.

18B—Ferrous

18B-1. Temper Brittleness of Plain Carbon Steels. Leonard D. Jaffe and Donald C. Buffum. *Metals Technology,* v. 15, Dec. 1948, TP 2482, 6 pages.

It is suggested that: plain carbon steels are susceptible to temper brittleness; that temper brittleness develops so rapidly in these steels that even drastic quenching from high temperatures is insufficient to suppress it; and that alloying elements retard the rate of development of temper brittleness. Limited experimental results support this hypothesis, which is contrary to previous theories. 13 ref.

18B-2. Selective Surface Hardening. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 87.

The "Flamatic" surface hardener and some of its applications.

18B-3. Control of Quality of Heat Treatment of Chromium-Nickel-Vanadium Steel Products by Magnetic Means. (In Russian.) M. N. Mikheev, P. N. Zhukova, and A. P. Voroshilova. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1210-1216.

The relationship of magnetic and electrical properties of the above steels to annealing and quenching temperatures was studied. On the basis of experimental results, the possibility of control of quenching and annealing on the basis of changes in their magnetic or electric properties was established.

18B-4. Determination of the Critical Rate of Quenching Under Factory Laboratory Conditions. (In Russian.) I. F. Afonskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Oct. 1948, p. 1267-1268.

A method of approximate determination on the basis of dilatometric curves. This method seems sufficiently accurate for all practical purposes.

18B-5. Heat Treatment of Tool Steels. E. J. Pavesic. *Tool & Die Journal,* v. 14, Jan. 1949, p. 50, 52-54.

Successful heat treatment of toolsteel involves the tool designer, the toolsteel manufacturer, and the heat treater. Full cooperation can lessen the problems of all three.

18B-6. La préparation des Atmospheres de cémentation gazeuse en France. (Preparation of Atmospheres for Case Hardening in France.) J. Pomey and M. Chateau. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 323-342.

A comprehensive study with particular reference to methods used in France. Theoretical cases of the process and factors involved are analyzed. Methods used in foreign countries and the possibilities of their application in France.

18B-7. Sur les problemes relatifs a la carburation et a la décarburation de l'acier. (Problems Related to the Carburization and Decarburization of Steel.) F. E. Harris. *Revue de Métallurgie,* v. 45, Sept. 1948, p. 347-355.

Factors controlling the diffusion of carbon into steel were evaluated experimentally. On the basis of the results, diagrams of "concentration-penetration" and depth of penetration vs. time are plotted. Method of investigation and apparatus.

18B-8. Heat Treatment of Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Jan. 1949, p. 162-166.

First of three articles describes heating cycles for five typical tool steels and results obtained.

18B-9. Selective Hardening Automobile Camshafts. *Steel,* v. 124, Jan. 10, 1949, p. 62.

18B-10. Metallurgy and Heat Treatment of Cutting Tools. P. Leckie-Ewing. *Iron Age,* v. 162, Dec. 30, 1948, p. 28-33; v. 163, Jan. 13, 1949, p. 60-64.

Problems encountered in selection of steel and in the development of optimum heat treatment cycles. Inspection and testing, and factors such as hardenability, hardness, toughness, and grain size. Means of temperature and atmosphere control, and special treatments such as refrigeration, nitriding, and chromium plating.

18B-11. Heat Treatment of Forgings and Die Blocks at A. Finkl & Sons Co. Part I. *Industrial Heating,* v. 15, Dec. 1948, p. 2068-2070, 2072, 2074, 2076, 2078, 2200.

Equipment and procedures of Chicago firm. (To be continued.)

18B-12. Surface Hardened Stainless Steels. Vincent T. Malcolm. *Product Engineering,* v. 20, Jan. 1949, p. 84-87.

Applications of stainless steels to parts that must resist wear and corrosion are extended by a surface hardening process known as Malcomizing. Details of the process and its effect on materials.

18B-13. Isothermal Heat Treating: A Compilation. F. R. Morral. *Wire and Wire Products,* v. 24, Jan. 1949, p. 39-47.

T-T-T diagrams may be drawn for many of the nearly 500 steel compositions assembled. (To be concluded.)

18B-14. (Book). **Electroplating in the Heat Treatment of Steel.** (In Russian.) A. M. Yampol'skiy. 80 pages. 1946. MASHGIZ (State-Scientific Publishing Co. for Machine-Construction Literature), Svendlovsk-Moscow, U.S.S.R.

The production of coatings intended to protect portions of the surface of steel parts during case-hardening and nitriding. Copper plating to 0.012-0.015 mm. is the method commonly used. In addition to giving compositions of plating baths and other solutions, particulars of plant, and operating conditions, it also includes recommendations for controlling the baths and for inspection and treatment of plated parts.

18B-15. Induction Hardening Mill Rolls. *Iron Age,* v. 163, Jan. 27, 1949, p. 71. Based on article by G. W. Seulen and H. Kuhlbars, *Iron and Coal Trades Review.*

Methods for application of surface hardening by induction heating to rolls up to 8 in. diam. and 12 in. long. The methods are total surface heating and a scanning or feed method. The scanning method is used for rolls of larger diameters.

18B-16. Predicting Carbon Penetration Curves in Carburizing. A. G. Guy. *Iron Age,* v. 163, Jan. 27, 1949, p. 74-76.

A simple method for calculating the above, employing solubility and diffusion data. It is claimed to be sufficiently accurate for practical use.

18B-17. Martempering. R. H. Aborn. *Metal Progress,* v. 55, Jan. 1949, p. 65-73.

Limitations and results of martempering carbon and low-alloy steels. Specific information about distortion, cracking, and the maximum size of bar that can be hardened by martempering.

18B-18. Discussion on Papers: Symposium on the Peeling of Whiteheart Malleable Cast Iron. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 17-34.

Discussion of papers published in Jan. 1948 and Nov. 1947 issues of *Journal of the Iron and Steel Institute.* (See items 18b-1, 18b-19, 18b-20 and 18b-21, 1948.)

18B-19. How to Quench Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Feb. 1949, p. 177-181.

Recommended quenching schedules, derived on the basis of transformation curves for the various types.

18B-20. Induction Hardening Automobile Parts. William J. Harris. *Steel,* v. 124, Feb. 7, 1949, p. 90-91, 128, 130.

Equipment and procedures used at Studebaker.

18B-21. Heat-Treatment in a Magnetic Field. J. Ferdinand Kayser. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 193-194.

Reviews literature. Refers only to ferromagnetic substances.

18B-22. Induction Hardening Increases Wear Life of Cast Iron Parts. H. R. Clauser. *Materials & Methods,* v. 29, Feb. 1949, p. 48-52.

A number of applications show that cast irons can be successfully induction hardened to give improved performance.

18B-23. Tools and Dies Bright Hardened and Brazed in New One-Step Process. Samuel Damon and A. L. Pranses. *Materials & Methods,* v. 29, Feb. 1949, p. 58-61.

Repair or modification of tools and dies as well as fabrication of new ones can be accomplished by a simultaneous brazing and heat treating technique for air hardening toolsteels.

18B-24. Selective Hardening of Dynaflow Transmission Parts. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 33, 82.

Equipment and procedures.

18B-25. Continuous Flame Hardening Speeds Chain Production. *Industrial Heating,* v. 16, Jan. 1949, p. 48, 50, 52, 56.

Procedures and equipment.

18B-26. Practical Pointers on Steel Treating, Part II. W. R. Bennett. *Modern Machine Shop,* v. 21, Feb. 1949, p. 112-114, 116, 118, 120, 122, 124, 126, 128.

Design of tools and dies, hard spots in annealed bars, furnaces and their applications, and a new furnace for heating steel. The home-made heat-treating furnace described is so built that a CO atmosphere can be generated within its chamber merely by dropping in a piece of charcoal at the beginning of each heat. With this furnace it was possible to heat treat straight-carbon; Mo; Mn oil-hardening; tungsten high-speed; and high-C, high-Cr steels without development of scale, soft exteriors, carburization, or decarburization.

18B-27. Infrared Installation Used for

Stress Relieving Springs. *Modern Machine Shop,* v. 21, Feb. 1949, p. 190, 192, 194.

18B-28. An Analysis of Nitriding. Howard E. Boyer. *Iron Age,* v. 163, Feb. 10, 1949, p. 68-74; Feb. 17, 1949, p. 93-98.

The status of nitriding as a competitive method. Part I: Surface-hardness data, comparing various commercial steels with specific nitriding grades; correlation with structural studies and the metallurgical factors involved. Part 11: the austenitic stainless and other steels; nitriding equipment, proper applications, precautions, and economic aspects.

18B-29. Heat Treatment of Forgings and Die Blocks at A. Finkl & Sons Co.: II. Heat Treat Plant No. 2. *Industrial Heating,* v. 16, Jan. 1949, p. 42-44, 46, 134.

(To be continued.)

18B-30. Mechanized Flame Hardening. J. R. Burg. *Machine Design,* v. 21, Feb. 1949, p. 132-134.

Typical machines of three basic types.

18B-31. Field Stress Relief of Vessels by Radiant Electric Heating. Milton Ludwig. *Petroleum Refiner,* v. 28, Feb. 1949, p. 109-111.

A new approach to an old problem. Simple method gives promise of wide application to typical cases encountered in process plants. Refers to stress relief of welded vessels.

18B-32. Designing for High-Frequency Induction Hardening. J. T. Temin. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 135-144; discussion, p. 144-146.

Design principles. Special fixtures and machines which have been developed for a variety of applications. Metallurgical aspects of the induction hardening process.

18B-33. Heat Treating Ferrous Metals. I. A. Usher. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 14-15, 21, 24, 31-33, 35.

Fundamental principles.

18B-34. Salt Bath Heating Rates. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 20.

Time necessary to heat steel pieces of various sizes to various temperatures in salt baths.

18B-35. Hardening Capacity of Engineered Metal Castings. C. R. Austin. *Steel,* v. 124, Feb. 21, 1949, p. 102-104, 106.

Methods of hardenability testing and factors which affect hardenability. Special properties of Meehanite cast iron in this respect. Recommends use of the Jominy end-quench test as a purchase specification for steels which are to be heat treated and hardened. Compares quenching power of oil and water.

18B-36. Heat Treatment Lowers Manufacturing Costs; An Informal Discussion for Production Men. Robert W. Campbell. *Steel Processing,* v. 35, Feb. 1949, p. 71-74, 89.

Concerned only with steel.

18B-37. Controlled Heat Treatment Increases Wear Resistance of Worm Gearing. *Product Engineering,* v. 20, Mar. 1949, p. 132.

Service life of large worm gearing used in heavy-duty, slow-speed vertical-shaft drive assemblies has been lengthened by substitution of heat treated Meehanite castings for the worms in place of case hardened worms made from SAE 1015 steel forgings.

18B-38. Carbon Correction for Steel Bars. J. D. Armour. *Steel,* v. 124, Mar. 7, 1949, p. 106-109, 144.

Maintenance or increase of surface carbon, obtainable with corrected bars, frequently provides adequate wear resistance and acceptable core toughness, at the same time eliminating subsequent machining operations. Controlled-atmosphere equipment for this heat treating operation.

18B-39. Controlled Atmospheres for Annealing Gas. C. E. Peck. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 73-85; discussion, p. 86-87.

Various types commercially applied to the annealing of a wide variety of steels.

18B-40. Practical Pointers on Steel Treating. Part III. W. R. Bennett. *Modern Machine Shop,* v. 21, Mar. 1949, p. 118-120, 122, 124, 126, 128, 130.

Salt baths for tempering and hardening; testing for hardness; preheating different steels; hardening cold striking dies.

18B-41. Cyanide Heat Treatment Gives Wear Resistance to Cast Parts. Z. T. Crittenden. *Foundry,* v. 77, Mar. 1949, p. 148, 150.

Use for camshaft sprocket gears for Pontiac engines.

18B-42. Heat Treatment of Field Welds in Steam Piping. R. O. Jackson. *Welding Journal,* v. 28, Mar. 1949, p. 266-267.

Procedures tested by experience for 0.5% Cr, 0.5% Mo main steam piping.

18B-43. How Tempering Affects Tool and Die Steels. Peter Payson. *Machinery* (American), v. 55, Mar. 1949, p. 168-170.

Effect of single and double tempering operations on structure and properties of typical tool and die steels. (Concluded.)

18B-44. Isothermal Heat Treating; A Compilation. Parts II and III. F. R. Morral. *Wire and Wire Products,* v. 24, Feb. 1949, p. 152-159; Mar. 1949, p. 236-243.

Over 400 steel analyses are tabulated in order of increasing percentages of one or more of the alloying elements present. The type of curve which each steel possesses and representative curves for Types I, II, and III alloys. 79 ref.

18B-45. How to Reduce Adverse Effects of Fabricating on Magnetic Properties of Steels. J. E. Ryan. *Materials & Methods,* v. 29, Mar. 1949, p. 49-51.

Proper annealing treatments and careful selection and control of fabricating techniques aid in maintaining high magnetic properties in electrical parts.

18B-46. Radiant Heating and Automatic Hydraulic Bending Combined to Form Steel Links. S. B. Voorhees. *Materials & Methods,* v. 29, Mar. 1949, p. 61-63.

Method involves heating bars in a radiant gas-fired furnace, then quickly forming the ends in a specially designed automatic hydraulic bending machine. After bending, the links are quenched immediately without reheating.

18B-47. Comparison of Commercial Carburizing Processes. Robert S. Burpo, Jr. *Materials & Methods,* v. 29, Mar. 1949, p. 85, 87.

Compares equipment, procedure, and results in tabular form for cyanide and activated-cyanide case hardening, salt-bath carburizing, pack carburizing and gas carburizing.

18B-48. The Stresses in Large Masses of Steel Cooling From the Austenitic Region. J. E. Russell. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 95-106; discussion, p. 398-431.

The distinction between "tessellated" and "macro" stresses; in order to estimate the latter it is essential to determine the course of the austenite transformation and the temperature at all points of the cooling body. An approximate method of deriving these data from S-curves is outlined for a eutectoid carbon steel, and results for an 8-cm. diam. bar of such a steel are computed for two conditions of cooling. 13 ref.

18B-49. Stress-Relief Treatment of Iron Castings. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 179-188; discussion, p. 398-431.

Recommendations for full stress relief, and for modified stress relief for stabilizing iron castings.

18B-50. Sulfiddiffusion bei der Aufkohlung von Stahl. (Sulfide Diffusion in the Carburization of Steel.) Friedrich Bischof. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Nov. 1948, p. 153-154.

Effect of annealing time and temperature on the diffusion of sulfides into different kinds of steel.

18B-51. Ueber Schalenbildung bei Weisskerntemperguss. (Skin Formation on White-Heart Malleable Iron.) Friedrich Bischof. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Jan. 1949, p. 19-22.

Causes and means of prevention. Heat treating experiments in CO-CO_2-SO_2 gas mixtures. Effect of high sulfur contents as well as carbon and sulfur diffusion. 14 ref.

18B-52. Einfluss des Gluhens im Durchziehofen auf die Festigkeitseigenschaften von verschieden vorbehandeltem Tiefziehbandstahl. (Effect of Annealing in the Continuous Tunnel-Type Furnace on the Strength Properties of Deep-Drawing Strip Steel Having Different Pretreatments.) Erich Schauff. *Stahl und Eisen,* v. 69, Jan. 20, 1949, p. 49-53.

Effects of different temperatures, rates of passage through the furnace, and rates of cooling on the strengths. 10 ref.

18B-53. Détermination rationnelle du traitement des pieces mécaniques en acier cémenté. (Rational Determination of Treatment of Machine Parts of Case Hardenable Steel.) Jacques Pomey. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 96-97.

A new method for preliminary heat treatment of the above steels prevents any possible changes in shape or dimensions after case hardening.

18B-54. Report of Graphitization Studies on High-Temperature Welded Piping of the Philadelphia Electric Company. J. B. Abele and A. E. White. *American Society of Mechanical Engineers,* Paper No. 48-A-94, 1948, 23 pages.

Investigations of weld sections from plain carbon steel piping. Results of a tension test on a weld section in a 4 million-lb. machine. Gives procedure used for solution treating followed by stress relief of 29 weld sections, and physical-test results after such treatment and subsequent service. Results demonstrate the practicability of restoring lightly or moderately graphitized weld sections by a rapid and relatively low-cost method.

18B-55. Einfluss der Erhitzungsgeschwindigkeit des Stahles auf die Perlit-Austenit-Umwandlung unter besonderer Berucksichtigung der Oberflächenhärtung. (Effect of the Heating Rate of Steel on the Pearlite-Austenite Transformation With Special Reference to Surface Hardening.) Walter Eilender and Robert Mintrop. *Stahl und Eisen,* v. 68, Feb. 26, 1948, p. 83-85.

A brief report. The experiments were made with 0.54% C steel.

18B-56. Untersuchungen uber die Anwendbarkeit der Zwischenstufenvergutung. (Research on the Applicability of Intermediate Temperature Annealing.) Winfried Connert and Heinz Kiessler. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 137-151.

The Brinell hardness and impact toughness of a steel (0.45% C, 1.4% Si, 0.9% Mn, and 1.1% Cr) annealed 3 hr. and quenched in salt baths at 200-400° C. were investigated; also the effect on toughness. Range of application of intermediate-temperature annealing. 20 ref.

18B-57. Einfluss der Anlasszeit auf die Härte von Werkzeugstahl. (Effect of Annealing Time on the Hardness of Toolsteel.) Alfred Krisch. *Stahl und Eisen,* v. 68, Apr. 22, 1948, p. 165.

Effect of annealing 1000 hr. at 50-270° C. on the hardness of different types of toolsteels.

18B-58. Die Ruckbildung der Aushärtung von Eisen-Kohlenstoff-Legierungen. (The Reversal of Age-Hardening of Iron-Carbon Alloys.) Werner Geller and Herbert Kuntze. *Zeitschrift fur Metallkunde,* v. 40, Jan. 1949, p. 16-24.

Property changes caused by age hardening. The effect of room-temperature age hardening on the hardness of two low-carbon steels. Age-hardening reversal tests were made at temperatures of 100-400° C. The difference between cold and hot age hardening. 21 ref.

18B-59. Increased Wear Resistance by Induction Hardening. Joseph F. Libsch. *Metal Progress,* v. 55, Mar. 1949, p. 34.

Experimental work to explain the fact that cylinder liners made of induction hardened 0.50% Cr, 0.55% C steel appear to stand up in service as well as high-carbon càrburized liners. Satisfactory performance can be expected because of the presence of undissolved alloy carbides in the hardened structure. The phase transformations involved.

18B-60. Heat Treatment of Forgings and Die Blocks at A. Finkl & Sons Co. III. (Concluded.) *Industrial Heating,* v. 16, Mar. 1949, p. 416-418.

Describes and illustrates Heat Treat Plant No. 4.

18B-61. Controlled Atmosphere Annealing of Malleable Iron. *American Foundrymen's Society,* Preprint No. 45, 1949, 3 pages.

Study of the literature and a survey of the practices. 32 ref.

18B-62. Graphitization of Gray Cast Iron by Heat Treatment. A. W. Silvester. *American Foundrymen's Society,* Preprint No. 40, 1949, 15 pages.

The time which combined carbon took to decompose at various temperatures. The graphitization rate of a sample of medium Si content was compared with one of high Si content.

18B-63. Practical Pointers on Steel Treating. Part IV. W. R. Bennett. *Modern Machine Shop,* v. 21, Apr. 1949, p. 116-118, 120, 122, 124, 126, 128, 130.

Formation of decarburized surfaces as a result of pack hardening.

18B-64. Protective Atmospheres in Industry. Part V. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, Apr. 1949, p. 25-28.

Effects of furnace atmospheres of H_2, N_2, CO_2, or dissociated NH_3 in preventing decarburization in various heating processes. Photomicrographs of steel heat treated in different atmospheres. (To be continued.)

18B-65. New Process for Alloying Chrome With Steel Surface Gives Superior Die for Zinc. A. Berger. *Die Castings,* v. 7, Apr. 1949, p. 40-41.

Reviews previous attempts. Process developed by R. L. Samuels involves packing steel in carburizing boxes together with a chromium-rich powder and subjecting the boxes to heat treatment in an ordinary gas furnace for 3-6 hr. depending upon the depth of penetration desired.

18B-66. Automatic Flame Hardening Steps Up Production of Steel Cams. Herbert Chase. *Materials & Methods,* v. 29, Apr. 1949, p. 47-49.

Method, equipment, and results obtained by Buick. On a cam ring having eight internal recesses, the inclined surfaces must be hardened while adjacent areas must remain soft.

18B-67. Specific Work Areas Surface Hardened by Concentrated Flame Method. Jay DeEulis. *Steel,* v. 124, Apr. 11, 1949, p. 86-88.

Full-scale industrial tool which

enables heat treaters to selectively pin-point the flame to the exact portion to be hardened.

18B-68. Structural Steels. Quintin C. McMillan. *Iron and Steel,* v. 22, Mar. 1949, p. 105-108.

Application of hardenability theory to large-scale practice. Mechanical handling and marquenching. (To be concluded.)

18B-69. Gas Cyaniding of High-Speed Steels. (In Russian.) A. P. Garashchenko. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 17-19.

Different methods and the method used in the USSR since 1940. Optimum conditions for different types of toolsteel.

18B-70. Technology of Hardening of Cutting Tools. (In Russian.) B. M. Askinazi. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Dec. 1948, p. 12-15.

Methods of hardening cutting instruments, emphasizing the high-frequency heat treatment which secures minimum deformation of the instrument and does not produce decarburization of the surface layer, since the heating lasts only a few seconds. Diagrams of equipment.

18B-71. Isothermal Treatment of Low-Alloy Steels. *Engineer,* v. 187, Mar. 25, 1949, p. 328-329. Translated and condensed from paper by Anton Pomp and Erich Rolf, *Archiv fur das Eisenhuttenwesen,* v. 19, 1948, p. 197-202.

Results of notched-bar and hardness tests on samples of a 1.8% Mn and a Cr-V steel cooled from various temperatures and transformed isothermally at different temperatures. For comparison, tests were made on steels treated in the conventional way, that is, hardened and tempered at the temperature used in the isothermal transformation.

18B-72. Reflections on Yielding and Aging of Mild Steel. II. The Strain-Aging of Steel. (In English.) J. H. Palm. *Metalen,* v. 3, Feb. 1949, p. 120-126.

Concludes critical review of the literature. Comparison of strain-aging and quench aging and their causes; the mechanism of strain aging; and blue brittleness. 64 ref.

18B-73. Prufung der Abschreckhärtbarkeit von Stahl an Plättchen. (Testing the Quenching Hardenability of Steel by Use of Small Flat-Plate Specimens.) Helmut Krainer, Karl Swoboda, and Franz Rapatz. *Stahl und Eisen,* v. 69, Feb. 17, 1949, p. 122-127.

Investigates the suitability of small steel plates (20 x 50 x 2-3 mm.) for determining the hardenability of steel. Photomicrographs show the structures of different steels quenched from different temperatures. 11 ref.

18B-74. Effects of Temperature and Silicon Content on First Stage Annealing of Black-Heart Malleable Iron. J. E. Rehder. *American Foundrymen's Society,* Preprint 26, 1949, 5 pages; discussion, p. 5.

The relationship between Si content and time necessary for first-stage annealing. Plotting of the log. of Si content vs. log. of first-stage annealing time produces a straight line, whose slope is dependent upon carbon content. Experimental data on the relationship between temperature and time necessary for first-stage annealing falls on straight parallel lines when plotted as log. time vs. temperature. Application to commercial practice.

18B-75. Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black-Heart Malleable Iron. J. E. Rehder. *American Foundrymen's Society,* Preprint 27, 1949, 7 pages.

A series of white cast-iron bars were made from a charge containing approximately 2.55% C and 0.76-1.57% Si. After completion of first-stage annealing, upper and lower limits of the critical temperature range during cooling at 7° F. per hr. were determined. It is shown that the upper limit rises uniformly as Si content increases, and that the lower limit rises in a slower, less regular manner. Austenite, ferrite and graphite co-exist within the range in apparent equilibrium. The Fe-C-Si diagram at 2% Si published by Greiner, Marsh, and Stoughton appears to be more accurate than that of Boyles. Practical applications.

18B-76. Influence of Rate of Heating on First Stage Graphitization of White Cast Iron. Richard Schneidewind and D. J. Reese. *American Foundrymen's Society,* Preprint 37, 1949, 9 pages.

Sections of step bars poured from the same heat were annealed at 1700° F. Rates of heating were 6500, 350, and 150° F. per hr., respectively, between the temperatures of 1200 and 1700° F. It was found that the time necessary to complete first-stage graphitization decreased as the heating rate was decreased. The mechanism of graphitization.

18B-77. Facts and Fancies About Ammonia Carburizing. Sam Tour. *Metal*

Progress, v. 55, Apr. 1949, p. 495-498.

Addition of ammonia to a prepared gas-carburizing atmosphere has been applied for parts which can tolerate no warpage during heat treatment yet need a hard surface with excellent wear resistance. Rather wide differences exist in published recommendations as well as in the details of installations. Areas where accurate studies are needed to supplant unsupported statements.

18B-78. Some Aspects of the Hardenability of Steels. H. J. French. *Metal Progress,* v. 55, Apr. 1949, p. 505-515.

Steels with the same end-quench hardness curves may have much different toughness, as measured by notch-bar tests at equal hardness and strength levels. This is true even though the steels may retain substantially equal amounts of austenite after the quench.

18B-79. Principles and Applications of Isothermal Heat-Treatment. J. M. Hodge. *SAE Quarterly Transactions,* v. 3, Apr. 1949, p. 267-273.

Previously abstracted from condensed version in *SAE Journal,* see item 18b-124, 1948.

18B-80. Precision Heat Treating Oil Well Sucker Rods. *Steel,* v. 124, Apr. 18, 1949, p. 85-86.

Sucker-rod requirements manufacturing facilities and heat-treating procedures.

18B-81. Heat Treatment of Welded Joints of High-Pressure Boiler Tubes. (In Russian.) V. G. Dolgikh. *Avtogennoe Delo* (Welding), Jan. 1949, p. 24-25.

The influence of different methods of heat treatment on the mechanical properties of welded joints in Cr-Mo steel boiler tubes.

18B-82. Surface Hardening of Wheel Rims by the Oxyacetylene Flame. (In Russian.) S. V. Begun. *Avtogennoe Delo* (Welding), Jan. 1949, p. 26.

Apparatus and procedure.

18B-83. Structural Steels; The Hardening Operation in Practical Heat Treatment. (Concluded.) Quintin C. McMillan. *Iron and Steel,* v. 22, Apr. 1949, p. 117-119.

Experimental data on several British structural steels. Conclusions concerning preferred heat treating schedules.

18B-84. Lathe Bed Ways Hardened by Induction Heating. Fred W. Vogel. *Modern Machine Shop,* v. 21, May 1949, p. 170-172, 174, 176.

Equipment and procedures.

18B-85. Practical Pointers on Steel Treating. Part V. W. R. Bennett. *Modern Machine Shop,* v. 21, May 1949, p. 182-184, 186, 188, 190, 192, 194, 196, 198.

Quenching, hardening carbon-steel milling cutters, and heating and quenching hot forge drop dies.

18B-86. Untersuchungen uber die Zwischenstufenvergutung verschieden legierter Stähle. (Research on Intermediate-Stage Annealing of Different Alloy Steels.) Wilhelm Bischof. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 13-18.

S-curves of different Cr, Mn, V, Mo, W, Cu, and C steels were established by determining their structures and hardnesses at the beginning and end of the isothermal austenite transformation. Effects of intermediate-stage and ordinary annealing are compared by correlating respective notch-impact strengths and hardnesses. Intermediate-stage annealing was found to have a favorable effect on vanadium steels.

18B-87. The Basic Principles of Carburizing. II. E. Barber. *British Steelmaker,* v. 15, Apr. 1949, p. 182-185.

Recommended procedures. Various types of carburizing furnaces. (To be continued.)

18B-88. Selective Surface Hardening With High-Temperature Flames. Charles H. Wick. *Machinery,* v. 55, May 1949, p. 154-160.

How exacting metallurgical specifications and close dimensional tolerances can be maintained, and results consistently duplicated, by selective surface hardening with the flame-spinning method.

18B-89. Special Handling During Heat Treating Minimizes Distortion in Long Bars. F. H. Bremmer. *Industrial Heating,* v. 16, May 1949, p. 780-782, 784, 786, 788, 928.

New equipment for heat treating drill collars up to 54 ft. long.

18B-90. The Acceleration of the Rate of Isothermal Transformation of Austenite. M. D. Jepson and F. C. Thompson. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 49-56.

Part I describes the effect of fluctuating temperature, a marked decrease in transformation time being observed in the martensite range. Most of the transformation occurs during the cooling part of the temperature cycle. Part II deals with effect of stress on rate of isothermal transformation over a range of temperatures, both tensile and compressive stresses being investigated. A simple, rapid, and sufficiently accurate method of following the course of the transforma-

tion, by measuring the load required to break notched test-pieces.

18B-91. The Design and Operation of Annealing Plant for Mild-Steel Sheets and Coils. Part I. Metallurgical Aspects of Annealing. R. D. Pollard. **Part II. Developments in Annealing Equipment and Practice.** H. Edwards and J. F. R. Jones. **Part III. The Annealing of Mild-Steel Coils.** J. Bromley Davis. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 79-97.

18B-92. Graphitizing Behavior of White Iron. S. C. Massari. *American Foundryman,* v. 15, May 1949, p. 67-72.

Results of a study of iron of chilled-car-wheel composition, annealed at temperatures of 1600-2000° F. so as to complete first-stage graphitization. Approximate time required to complete first-stage graphitization and the type of graphite formed.

18B-93. Flame Hardening Large Gears. Paul A. Furkert. *Industrial Gas,* v. 27, May 1949, p. 13, 20-21.

Set-up developed.

18B-94. Liquid Salt Baths. Part II. (Concluded.) J. A. McElgin. *Canadian Metals and Metallurgical Industries,* v. 12, May 1949, p. 18-20, 29, 33, 35-38.

Procedures and equipment for heat treating, quenching, and martempering of tools and miscellaneous steel parts.

18B-95. Salt-Bath Chromizing. *Iron Age,* v. 163, May 26, 1949, p. 71-72. Condensed from paper by I. E. Campbell, V. D. Barth, R. F. Hoeckelman, and B. W. Gonser.

Chromizing by immersion of ferrous metals in fused salt baths containing 5-30% $CdCl_2$ was found to compare favorably with conventional pack methods both in over-all cost and in rate of case formation.

18B-96. Die Härtbarkeit und Vergutbarkeit der Stähle. (Hardenability and Temperability of Steel.) W. Gerber and U. Wyss. *Von Roll Mitteilungen,* v. 7, June-Sept. 1948, p. 13-49.

An extensive descriptive review of the literature. 83 ref.

18B-97. The Effect of Tempering on Tool and Die Steels. P. Payson. *Machinery* (London), v. 74, May 12, 1949, p. 626-628.

18B-98. Baffle-Box Method Reduces End-Hardening Costs. *Railway Engineering and Maintenance,* v. 45, June 1949, p. 577-578.

Method of heat treating rail ends in track with hand torches which includes baffle boxes to protect flame from the wind.

18B-99. Heat Treating for Dimensional Stabilization. *Iron Age,* v. 163, June 2, 1949, p. 76.

Special procedure developed by International Harvester for diesel-fuel-injection pumps.

18B-100. Induction Annealing of Light Steel Stampings Increases Production, Cuts Costs. H. R. Clauser. *Materials & Methods,* v. 29, June 1949, p. 51-53.

Selective annealing of critical areas of small automotive stampings before or after forming to prevent cracking and restore ductility.

18B-101. Hardening Enhances Properties of Malleable Iron. Kenneth Rose. *Materials & Methods,* v. 29, June 1949, p. 56-58.

Malleable irons—particularly the pearlitic types—can be surface and locally hardened to improve wear resistance or increase strength.

18B-102. Practical Pointers on Steel Treating. Part VI. W. R. Bennett. *Modern Machine Shop,* v. 22, June 1949, p. 116-118, 120, 122, 124, 126, 128, 130.

Cold header dies, rehardening, oil hardening Mn steel, and quenching baths.

18B-103. Problems in Heat Treating. Part II. Growth and Distortion. Howard E. Boyer. *Steel Processing,* v. 35, May 1949, p. 257-260.

Concerned only with steel.

18B-104. Casehardening Steels in Cyanide-Containing Salt Baths. F. D. Waterfall. *Metallurgia,* v. 40, May 1949, p. 29-36, 43.

Conventional type is suited to production of case depths up to 0.025 in. and accelerated type for depths up to 0.09 in. Casehardening structures and effects of variables.

18B-105. Annealing of Steel Containing Small Amounts of Boron. (Some Problems of the Physics of Annealing.) (In Russian.) S. M. Vinarov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Feb. 1949, p. 243-250.

Investigated for steel containing 0.35-0.37% C, 0.20-0.23% Si, 0.50-0.67% Mn, and 0.001-0.1% B. Results indicate that steel containing 0.003-0.004% B is most readily annealed with simultaneous decrease in size of the austenite grains, contrary to general opinion. Attempts to explain this phenomenon.

18B-106. Aus der Walzhitze abgeschreckter unlegierter Baustahl St 52. (Unalloyed Structural Steel St 52 Quenched After Hot Rolling.) Franz Nehl. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 186-194.

The effect of quenching on the strength properties of 0.20%-C steel. including the uniformity of strength during continuous production, and the effect of local heating on fatigue strength of welded beams.

18B-107. Druckluft als Kuhlmittel beim Patentieren von Stahldraht. (Compressed Air as a Cooling Agent in the Patenting of Steel Wire.) Wilhelm Pungel. *Stahl und Eisen,* v. 69, Apr. 14, 1949, p. 262-265.

Proposes substitution of compressed air for lead or salt baths. Process. Test results with wires of different composition. Structures of compressed-air-patented wires drawn at different rates.

18B-108. Auswirkung der Hartung aus der Walzhitze bei Vergutungsstahlen. (Hardening of Heat-Treated Steels Following Hot-Rolling.) Franz Bollenrath and Heinz Kiessler. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 287-301; discussion, p. 301.

Known methods of tempering steels directly from the heat of hot working and their advantages and disadvantages. Cooperative research data indicate no basic improvement in strength properties over those obtained by ordinary heat treatment. However, other advantages are cited. 21 ref.

18B-109. Umelé atmosféry pro tepelné zpracovani ocele. (Prepared Atmospheres for Heat Treatment of Steel.) Bohuslav Holman. *Hutnické Listy,* v. 3, Dec. 1948, p. 362-366.

Coloring of steel in heating furnaces cannot be attributed to the influence of CO_2 and H_2O only. The CO-CO_2 ratio as determined by Heiligenstadt for hypo-eutectic steels is shown to change gradually to values derived by Holcroft for steels of higher carbon content. Comparison of Heiligenstadt's and Holcroft's data with those of Heyn on the carburization of steels in atmospheres of high hydrogen concentration proves that hydrogen influences the carburization potential of the atmosphere very slightly.

18B-110. (Book) **Steel and Its Heat Treatment. Vol III. Engineering and Special-Purpose Steels.** Ed. 5, D. K. Bullens and Metallurgical Staff of Battelle Memorial Institute. 606 pages. 1949. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y.

Effect on suitability of the different steels for various uses. Possibilities of utilizing alternate steels. Treating engineering alloys, constructional alloys, and special steels. (Vols. I and II were previously abstracted.)

18B-111. Protective Atmospheres in Industry. Parts VI and VII. A. G. Hotchkiss and H. M. Webber. *General Electric Review,* v. 52, May 1949, p. 30-37; June 1949, p. 33-41.

May installment describes effects of atmospheres of combusted fuel gas—purified and unpurified—and catalytically reacted fuel gas in preventing decarburization in various heating processes. Neutralene and Thermalene gas-producing equipment. Comparative structures. June installment deals with methods of carburizing; advantages of gas atmospheres; carrier gases and what they accomplish; and importance of dew point and other atmospheric conditions in obtaining desired carbon penetration, concentration, or restoration. Equipment. (To be continued.)

18B-112. Gas Carburizing. C. H. Leland. *Metal Progress,* v. 55, June 1949, p. 811-815.

Practical problems involved, indicating simple fundamental principles which must be understood in order to obtain good results. A few common shop troubles and how to correct them. Prefers batch-type carburizing for most jobs, especially where less-than-maximum surface carbon is specified.

18B-113. Carbide Replaces Steel for Razor-Blade Tempering. *American Machinist,* v. 93, June 16, 1949, p. 84.

18B-114. Härteverhalten und Schneideigenschaften von Stählen mit 9 bis 13% Cr. (Hardenability and Machinability of Steels Containing 9-13% Cr.) Franz Rapatz, Helmut Krainer, and Karl Swoboda. *Archiv fur das Eisenhuttenwesen,* v. 20, Mar.-Apr. 1949, p. 115-123.

The effects of hardening and tempering (with and without severe quenching) on the structures, high-temperature tensile strengths, hot hardnesses, and machinabilities of high-carbon (1-2% C) steels alloyed with varying percentages of Si, Mn, Cr, Mo, V, and W. 21 ref.

18B-115. Dew Point vs. $\%CO_2$ as Furnace Atmosphere Control Check. Wilson T. Groves. *Industrial Heating,* v. 16, June 1949, p. 966-970, 972, 974, 976, 978, 980, 1086.

Uses several of the gas equilibrium equations formulated by Harris to prepare charts showing relationships between the gaseous constituents of common prepared atmospheres and carbon concentrations of the steel in contact with them. How the heat treater can evaluate his atmosphere in terms of $\%CO_2$ and dew point.

18B-116. Isothermal Heat Treatment of Large Steel Castings. Don Rosenblatt. *Iron Age,* v. 163, June 30, 1949, p. 42-47.

Practical limitations imposed by economics which introduce difficulties in meeting metallurgical requirements when heat treating large, low-alloy steel castings. Systematic investigation of the adaptability of various heat treatment cycles, including considerable quantitative data. Application of the techniques to plain carbon steel castings.

18B-117. Practical Pointers on Steel Treating. Part VII. W. R. Bennett. *Modern Machine Shop,* v. 22, July 1949, p. 166, 168-170, 172-174, 176-177.

Deals with high speed steel. Annealing, preheating, heating for hardening, cooling rate, and checking pyrometer readings by use of a hardness tester.

18B-118. The Basic Principles of Carburizing. III. E. Barber. *British Steelmaker,* v. 15, June 1949, p. 282-285.

The technique of gas carburizing, with its advantages, and the various types of carburizing furnaces. Modern methods of liquid carburizing; causes of unsatisfactory carburizing. (To be continued.)

18B-119. Entfestigungsgluhen verschiedenartig erschmolzener kohlenstoffarmer Bandstähle im Durchziehofen. (Stress-Relief Annealing in the Continuous Annealing Furnace of Low-Carbon Strip Steels Melted by Different Methods). Anton Pomp, Jacques Brockhaus, and Georg Niebch. *Archiv fur das Eisenhuttenwesen,* v. 20, May-June 1949, p. 199-204.

Strength properties of five cold rolled stress-relief-annealed strip steels compared with those of similar steels stress-relieved by customary methods.

18B-120. Planning a Cyanide Heat Treating Layout. P. D. Lilly. *Steel Processing,* v. 35, June 1949, p. 323-325.

Basic layout diagram, also diagrams of the furnace and of workholding jigs. Loading and unloading, preliminary degreasing, oil cooling and neutralization of swill water.

18B-121. Induction Hardening Successfully Applied to Large Steel Bearing Races. R. H. Lauderdale. *Materials & Methods,* v. 30, July 1949, p. 57-60.

How scale-free, hard-wearing roller path surfaces with practically no distortion were obtained using high-frequency surface hardening.

18B-122. Some Influencing Factors in Tool Steel Heat Treatment. E. J. Pavesic. *Tool Engineer,* v. 23, July 1949, p. 32-33.

Recommendations for best results.

18B-123. Cooling of Quenching Oils. C. L. Ringquist and L. J. Hess. *Heating and Ventilating,* v. 46, July 1949, p. 49-56.

Heat treating and quenching of steel with particular emphasis on temperature control in the quenching bath.

18B-124. Heat-Treating Steel Parts for Allison Jet Engines. E. P. Zink. *Machinery,* v. 55, July 1949, p. 142-151.

Techniques developed for hardening, carburizing, and nitriding.

18B-125. The Action of Boron in Hardening Steel. Leon D. Gruberg, *Canadian Metals and Metallurgical Industries,* v. 12, July 1949, p. 20-21, 34.

Reports investigation. It is shown that the action of boron in increasing the hardenability is due entirely to a solid-solution effect at heat-treating temperatures.

18B-126. Flame Hardening Large Gears. Paul A. Furkert. *Industrial Heating,* v. 16, July 1949, p. 1172-1174.

Advantages are illustrated by a detailed description of experiences of two manufacturers.

18B-127. Case Hardening Automobile Parts. Martin Neumeyer. *Iron Age,* v. 164, July 14, 1949, p. 100-104.

Already applied to the case hardening of more than 150 different types of parts, including stampings, screw-machine parts and forgings, the controlled-atmosphere furnace described has effected substantial savings.

18B-128. Induction Heating Ninety-Four Typewriter Parts Per Hour. *Steel,* v. 125, July 18, 1949, p. 118.

Semiautomatic operation.

18B-129. Localized Heat Treatment. William F. Sorrenson. *Iron Age,* v. 164, July 28, 1949, p. 52-57.

Construction features of a simple rotary flame heating machine, adaptable to a wide variety of sizes and shapes of work pieces. The equipment can be utilized for local annealing as well as for heating and subsequent quenching.

18B-130. How To Heat-Treat Spur Gears by Induction Heating. J. A. Redmond. *American Machinist,* v. 93, July 28, 1949, p. 83-94.

"Special Report" gives extensive information by means of text, graphs, diagrams, and photographs. Equipment, procedure, and metallurgical results.

18B-131. Flame Hardening. *Welding Journal,* v. 28, July 1949, p. 641. Reprinted from *Tempil Topics,* Apr. 1, 1949.

Process, its principles, and applications.

18B-132. Cereedschapstaal. (Toolsteels.) F. van Wijk. *Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen,* Feb. 1949, p. 10-13.

Toolsteel field with special attention to modern heat-treatments, such as martempering, austempering and subzero treatment. Classification according to properties, as proposed by Carpenter Steel Co., is preferred over one by chemical composition. Methods of testing steels are briefly discussed.

18B-133. Influence of Microfissures Formed During Hardening on Properties of Steel. (In Russian.) V. A. Pavlov and M. V. Yakutovich. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 471-480.

Investigated for a steel with and without microfissures. Mechanical properties of both types, annealed to 200, 300, 400, 500, 600 and 700° C. were studied during application of torsional force. Presence of microfissures decreases values of maximum relative shear by 90% at annealing to 200° C. and by 25-30% at temperatures between 400 and 600° C. After annealing to above 650° C., plastic properties of both specimens are identical.

18B-134. Application of Isothermal Treatment for Increasing the Strength of Structural Steel. (In Russian.) L. M. Pevzner. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Apr. 1949, p. 481-491.

Experimental data indicate that isothermal treatment, causing formation of bainite, permits considerable increase in the structural strength of some steels. Steel with a bainite structure possesses considerably higher strength than the same steel with low-annealed martensite or sorbite structure.

18B-135. Rate of Cooling During Quenching as Related to Through-Hardenability of Steel. (In Russian.) M. E. Blanter. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 557-566.

Problem investigated, indicating the influence of various factors including shape and size of piece being quenched. A new method for determining optimum conditions of quenching applicable on an industrial scale. Folded nomographic chart relates these factors and permits rapid determination of optimum quenching conditions.

18B-136. Analytical Method for Calculation of Conditions for Annealing of Steel. (In Russian.) G. N. Kozlovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 567-569.

Modifies and applies Kazeev's equation for physicochemical processes to calculation of the many factors in annealing of steel. Results of sample calculations for carbon and low-alloy steel.

18B-137. Heat Treating Theory and Practice. A. M. Hall. *Metals Review,* v. 22, July 1949, p. 5-8.

New developments reported in literature of the past 12 months. Confined to ferrous metals and alloys. Theory of austenite transformation and toolsteel treatment. Practical developments are in high-speed gas heating, induction, case hardening, and atmosphere control. (References to "A. S. M. Review of Current Metal Literature".)

18B-138. A Critical Review of the Nitriding Process. Part II. Lester F. Spencer. *Steel Processing,* v. 35, July 1949, p. 375-380, 382, 390.

Concludes review of the literature. Characteristic microstructures of nitrided surfaces. 47 ref.

18B-139. The Influence of Heating Rate in Malleable-Iron Annealing. S. W. Palmer. *Engineering,* v. 168, July 15, 1949, p. 69-72. A condensation.

Rate of heating has an important influence after the top annealing temperature has been reached, and the final microstructure obtained depends to a considerable extent upon the rate of heating.

18B-140. Practical Pointers on Steel Treating. Part VIII. *Modern Machine Shop,* v. 22, Aug. 1949, p. 114-116, 118, 120, 122, 124, 126, 128.

Recommended methods for properly heat treating high-speed steel.

18B-141. Continuous Selective Hardening of Hopper-Fed Cylindrical Parts. *Production Engineering & Management,* v. 24, Aug. 1949, p. 50.

Uniformity of case depth, with automatic work handling and at feed rates up to 6 in. per sec., is obtained with radio-frequency hardening system.

18B-142. Recent Heat-Treatment Developments. *SAE Journal,* v. 57, Aug. 1949, p. 56-57.

Summarizes four papers presented at SAE National Passenger Car, Body, and Production Meeting, Detroit, Mar. 9, 1949: "Heat-Treatment Atmospheres", O. E. Cullen; "Gray Iron Heat-Treatment", C. F. Joseph; "Induction Heating", A. W. Herbenar; and "Salt Bath Heat-Treatments", L. B. Rosseau.

18B-143. Gray Iron Parts Successfully Surface-Hardened in the Flask. A. P. Alexander. *Materials & Methods,* v. 30, Aug. 1949, p. 58-59.

Unique method for hardening gray iron at the time of casting which produces satisfactory surface hardness at lower cost than by other methods.

18B-144. Oil Rig "Kelly" Rods Toughened by Controlled Manufacturing Methods. *Steel,* v. 125, Aug. 1, 1949, p. 90, 93.

Controlled processes center around alternate heating, forging, and close inspection techniques. A "Kelly" is the steel link that picks up the driving power of an oil rig's engines and transmits it to the drill string.

18B-145. Versatility of Oxyacetylene Flame-Hardening. J. T. Howat. *Steel,* v. 125, Aug. 8, 1949, p. 64-67, 94.

Various examples of production flame-hardening setups. Procedures for various types of steels and ways to prevent typical heat treating defects from occurring as a result of the high-temperature local heat sources being applied.

18B-146. Homogeneous Carburizing. Orville E. Cullen. *Iron Age,* v. 164, Aug. 11, 1949, p. 83-87, 130, 132.

A through-carburizing technique that makes possible the fabrication of medium and high-carbon steel parts from low-carbon steel stock. The process and existing and potential practical applications.

18B-147. The Influence of Heating Rate in Malleable Iron Annealing. S. W. Palmer. *Foundry Trade Journal,* v. 87, July 28, 1949, p. 107-118; Aug. 4, 1949, p. 139-148.

Previously abstracted from *Engineering.* See item 18B-139, 1949.

18B-148. A Critical Review of the Nitriding Process. Lester F. Spencer. *Steel Processing,* v. 35, June 1949, p. 311-318; July 1949, p. 375-380, 382, 390.

Advantages and disadvantages. Nitriding compositions and effects of each element contained in the standard nitriding analysis (C, Al, Cr, Ni, Mo, S, Se, and Si). Details of the process (alternate methods) and equipment. Physical properties of some nitriding steels and effects of variations in compositions and treatment conditions. 47 ref.

18B-149. Some Observations on the Accuracy of Isothermal Diagrams. B. F. Shepherd. *Iron Age,* v. 164, Aug. 25, 1949, p. 61-66.

Extensive cooling-rate experiments indicate that steel specimens undergoing transformation during quenching do so at higher temperatures than those used in isothermal transformation diagrams. Supporting data in the form of cooling curves and cooling-rate curves for various conditions.

18B-150. Induction Heating Solves Hardening Problems. Fred McNall and Richard A. Gehr. *American Machinist,* v. 93, Aug. 25, 1949, p. 100-102.

How valve seats, piston rods, setscrews, and crosshead pins are successfully hardened with higher production rates, better quality and lower cost.

18B-151. Strain-Age-Hardening. C. A. Edwards. *Iron and Steel,* v. 22, July 1949, p. 365-368; Aug. 1949, p. 401-404.

Present knowledge of hardening by quenching, quench-age hardening, and strain-age hardening. 26 ref. (To be concluded.)

18B-152. Induction Hardening of Lawn Mower Blades and Cutters. *Machinery* (London), v. 75, Aug. 4, 1949, p. 154-155.

Equipment and procedures.

18B-153. Einfluss der Wärmebehandlung auf die magnetischen Eigenschaften eines Chrom-Magnetstahls. (Effect of Heat Treating on the Magnetic Properties of a Chromium Magnet Steel.) Werner Jellinghaus. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 249-254.

Experimental results.

18B-154. Einfluss der Anlasszeit auf die Härte von Werkzeugstahl. (Effect of Annealing Time on the Hardness of Tool Steel.) Anton Pomp and Alfred Krisch. *Archiv für das Eisenhüttenwesen,* v. 20, July-Aug. 1949, p. 255-262.

The effect of intermittent annealing of 24 toolsteels for about 1000 hr. in the range 50-270° C. was studied. Experimental procedure and results. 27 ref.

18B-155. Isotermicke kaleni. (Isothermal Quenching.) Cenek Duchon. *Hutnické Listy,* v. 4, Apr. 1949, p. 105-112; May 1949, p. 142-143.

Use of alloying elements which increase hardenability, such as Mn, Cr, Ni, and Mo, and proper choice of austenitizing temperatures, to extend isothermal quenching to depths of 25 mm. or more. Summarizes present knowledge of isothermal changes in various types of alloy steel in the upper portion of the S-curve.

18B-156. Concerning the Study of Isothermal Transformations in High Speed Steel. III. (In Japanese.) S. Koshiba. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, May 1949, p. 40-43.

Effect of heat treatment variables on five different types of high speed steel was studied. Mechanism of the transformation at 300° C. Effects of time of treatment on cutting-tool serviceability were determined.

18B-157. Heat Treatment of Tool Steels by Martempering. Richard Paul Seelig.

Iron Age, v. 164, Sept. 1, 1949, p. 72-76.
Application of martempering to heat treating tool and die steels in comparison with other heat treatment procedures. Influence of heat treatment variables on hardness, distortion, and dimensional stability.

18B-158. Increasing Output of Induction Hardened Parts With Automatic Work Fixtures. John Evans. *Automotive Industries,* v. 101, Sept. 1, 1949, p. 38-39, 67.
Several examples.

18B-159. Stress-Relief Heat Treatment of Alloy Cast Iron. M. M. Hallett and P. D. Wing. *Foundry Trade Journal,* v. 87, Aug. 11, 1949, p. 177-183.
Results of an experimental investigation of the above, using ring-shaped test pieces, subjected to preliminary treatment at 550° C. for 1 hr. Materials used were sand-cast gray iron and centrifugally cast liner iron, austenitic iron, and 33% Cr iron.

18B-160. Continuous Gas Carburizing. R. J. Cowan. *Steel,* v. 125, Sept. 5, 1949, p. 78-81, 127; Sept. 12, 1949, p. 114-116, 118, 120.
Formation of CG gas, carbon deposition within the muffle, dry cyaniding, use of oil instead of gas as a source of hydrocarbon and control of carburizing atmosphere.

18B-161. Practical Pointers on Steel Treating. Part IX. (Concluded.) W. R. Bennett. *Modern Machine Shop,* v. 22, Sept. 1949, p. 138, 140, 142, 144, 146, 148, 150, 152, 154, 156.
Pack hardening high speed steel; long draw, high-carbon, high-chromium; and hardening splined shafts.

18B-162. Recuit des fontes malléables à coeur noir. (Annealing of Blackheart Malleable Cast Iron.) Gabriel Joly. *Fonderie,* June 1949, p. 1624-1625.
Optimum annealing condition for iron containing 2.30-2.45% C, 1.20-1.40% Si is: heating to 920° C. as rapidly as possible, holding at this temperature for 30 hr., cooling very rapidly to 780° C., and cooling to 690° C. over 60-80 hr.

18B-163. Properties of Heat Treated Alloy Castings. J. B. Caine and R. S. Haught. *Metal Progress,* v. 561, Sept. 1949, p. 360-B.
Properties after tempering at 1200° F., shown by graphs of hardness vs. cooling rate, and micrographs, for six alloy steel compositions. Other mechanical properties are also indicated. (Data sheet.)

18B-164. Slack Quenching Versus Quench Cracking. J. B. Caine and R. S. Haught. *Metal Progress,* v. 56, Sept. 1949, p. 361-366.
Experience seems to indicate that brittle failures in service occur only in steels whose Charpy impact at service temperature is less than 10 ft-lb. and is independent of microstructural constituents and their distribution. "Slack quenching", therefore, should be permissible for the vast majority of steel castings, plain or alloyed, since it gives far better Charpy values than annealing.

18B-165. Precision Heat Treating Small Steel Parts at IBM. Herbert Chase. *Iron Age,* v. 164, Sept. 15, 1949, p. 83-87.
Practices and equipment.

18B-166. An Engineering Analysis of the Problem of Quench Cracking in Steel. J. W. Spretnak and Cyril Wells. *American Society for Metals,* Preprint No. 14, 1949, 36 pages.
As a result of a statistical analysis of thousands of quench-cracking data obtained in commercial practice, effect of quench cracking, of pouring temperature, ingot size, forging reduction, position of steel in ingot, composition, hardenability, uniformity of quenching conditions, temperatures to which cylinders are quenched, and special pre-bore quenching treatments was determined. Among the remedies, that of pre-bore quenching appears to be one of the most effective. 13 ref.

18B-167. Pre-Bore Quench for Hollow Cylinders. J. W. Spretnak and C. C. Busby. *American Society for Metals,* Preprint No. 15, 1949, 12 pages.
The effect of pre-bore quenching on the minimum depth of notch required to cause cracking of standard specimens, 6.5 in. o.d., 2.75 in. i.d., and 0.5 in. thick. Pre-bore quenching involves a water quench of the bore for a certain period of time, prior to the simultaneous quenching of both bore and outer surfaces of hollow cylinders.

18B-168. The Effect of Alloying Elements on the Transformation Characteristics of Induction-Heated Steels. Joseph F. Libsch, Wen-Pin Chuang, and William J. Murphy. *American Society for Metals,* Preprint No. 21, 1949, 27 pages.
Alloying elements are classified into two fundamental groups: carbide-formers and ferrite-strengtheners; the influence of each group. Isothermal transformation diagrams for AISI 4340 and 1050 steels austenitized by induction heating. Data from end-quenched specimens were used to study the degree of alloy solution in the austenite. For proper selection of alloy steels to be used

in induction hardening, the austenitizing cycle and the nature of the alloying elements must be considered. 15 ref.

18B-169. Isothermal Temper Embrittlement. Leonard D. Jaffe and Donald C. Buffum. *American Society for Metals,* Preprint No. 23, 1949, 12 pages.

A TTT diagram was determined for an SAE 3140 steel. Temperature of transition from ductile to brittle failure in the Charpy test was used as a measure of extent of transformation. 13 ref.

18B-170. Dry Cyaniding Reduces Costs on Variety of Steel Parts. F. R. Nethaway. *Materials & Methods,* v. 30, Sept. 1949, p. 61-63.

In addition to handling batch production at low cost, Oldsmobile setup permits close control over case concentration and depth, and holds distortion to a minimum.

18B-171. Strain Aging in Welding Structural Steel. Part II. W. H. Bruckner and S. W. Sandberg. *Welding Journal,* v. 28, Sept. 1949, p. 397s-404s.

Sensitivity of strain-aged specimens of base and weld metal and effects of thermal (stress relief) treatment on structure and properties.

18B-172. Large-Scale Production Carburizing. *Steel,* v. 125, Sept. 26, 1949, p. 64-65.

Results of standardized heat treating procedures on automotive parts.

18B-173. The Basic Principles of Carburizing. IV. E. Barber. *British Steelmaker,* v. 15, Aug. 1949, p. 390-393.

Further causes of unsatisfactory carburizing. The correct practice in the carburizing of a specific example —a spline shaft. Methods of local carburizing. (To be concluded.)

18B-174. The Basic Principles of Carburizing. V. (Concluded.) E. Barber. *British Steelmaker,* v. 15, Sept. 1949, p. 444-447.

Cyaniding and its applications and equipment.

18B-175. Thermal Treatment; German Forgings, Castings, and Armour Plate. *Iron and Steel,* v. 22, Sept. 1949, p. 437-439. Condensed from Section VI, BIOS Overall Report No. 15, H. M. Stationery Office, London. (To be concluded.)

18B-176. Strain-Age-Hardening. (Concluded.) C. A. Edwards. *Iron and Steel,* v. 22, Sept. 1949, p. 439-440.

Conclusions reached in the course of this review with special reference to the effect of some elements.

18B-177. Carburizing - Martempering Procedure Streamlines Crankshaft Heat Treating. Joseph J. Ebner. *Steel,* v. 125, Oct. 3, 1949, p. 72-74, 94.

Combination heat treating setup at Evinrude Motors, which uses salt in four baths. Besides substantially decreasing distortion of drop-forged shafts, this one-operator supervised method provides close control and uniform carburization of all surfaces with assured penetration.

18B-178. Les recherches sur la trempe isotherme en France et à l'Étranger. (Research on Isothermal Quenching in France and in Foreign Countries.) G. Delbart and M. Ravery. *Revue de Métallurgie,* v. 46, June 1949, p. 399-418.

Comprehensive survey. Methods for study of isothermal transformation, influence of alloying elements on shape of the "S" curve, and the pearlitic or Ar′ transformation. (To be continued.)

18B-179. A Horizontal Scanner for Industrial R-F (Radio-Frequency) Hardening. *Industrial Heating,* v. 16, Sept. 1949, p. 1558, 1560, 1562, 1564, 1640, 1642.

Scanner developed by Westinghouse Electric Corp. for hardening shafts and pins.

18B-180. Furnace Management. Trebor B. Morris. *Metal Progress,* v. 56, Oct. 1949, p. 501-503.

Continuous furnace for heat treatment which is also used as a gas carburizer.

18B-181. Annealing for Machinability. Kenneth Midlam. *Metal Progress,* v. 56, Oct. 1949, p. 504-505.

Isothermal treatment of X4340 which increases furnace capacity 56% at the American Locomotive Co., Railway Steel-Spring Div.

18B-182. Flame Hardening. A. E. Anderson and R. H. Lundquist. *Metal Progress,* v. 56, Oct. 1949, p. 506-508.

Machine used for flame hardening tractor gears.

18B-183. Heat Treating Parts at Packard. Fred W. Vogel. *Modern Machine Shop,* v. 22, Oct. 1949, p. 98-104, 106.

Methods and equipment.

18B-184. Multi-purpose Induction Hardening Units. *Machinery* (London), v. 75, Sept. 22, 1949, p. 413-415.

Heat treatment of parts of portable electric tools with an induction heating unit.

18B-185. Gas Carburizing. A Review of Equipment Developed by Birlec Ltd. *Automobile Engineer,* v. 39, Sept. 1949, p. 345-349.

18B-186. Delayed Quench for Steel Castings. S. L. Gertsman. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 91-99; discussion, p. 99.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-2. See item 18b-60, 1948.

18B-187. Effect of Manganese-Sulphur Ratio on the Rate of Anneal of Black-Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 138-145; discussion, p. 145-151.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-30. See item 18b-61, 1948.

18B-188. Stress Relief of Gray Cast Iron. J. H. Schaum. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 265-277; discussion, p. 277-278.

Results of a number of experiments. One set of experiments consisted of making relaxation tests and using the rate of relaxation as a means of evaluating stress relief. Observations of heat treatments on highly stressed cast wheels. 15 ref.

18B-189. Some Principles Involved in Heat Treatment of Gray Cast Iron. Alfred Boyles. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 462-472; discussion, p. 472.

See abstract from *American Foundryman,* item 18b-76, 1948.

18B-190. Gray Iron Hardenability and Its Relation to Air Quenching of Castings. R. A. Flinn and R. J. Ely. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 508-515; discussion, p. 515-517.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-35. See item 18b-62, 1948.

18B-191. Conventional vs. Salt Bath Hardening of Cast Iron Cylinder Liners. G. M. Lahr. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 536-541; discussion, p. 541-542.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-42. See item 18b-63, 1948.

18B-192. Eigenschaften von aufgekohlten Sinterstahlkörpern. (Properties of Carburized Sintered Steel Bodies.) Gerhard Will. *Stahl und Eisen,* v. 69, Sept. 1, 1949, p. 630-634; discussion, p. 634-635.

To increase their strength properties, sintered iron parts were carburized with illuminating gas, H_2-CO mixtures, and by addition of powdered cast iron or graphite. Carburization with gases was found unsatisfactory; but the parts that were carburized by use of iron powder or graphite had relatively high tensile-strengths.

18B-193. Relationship Between Hardness and Tempering Temperature: Carbon and Alloy Steels, Including Series 1000, 1300, 3100, 3200, 4100, 2300, 4600, 5100, and 6100. *Materials & Methods,* v. 30, Oct. 1949, p. 95.

18B-194. The Stress-Relieving of Welded Structures. R. Weck. *Welding,* v. 17, Oct. 1949, p. 442-452.

Purpose of stress-relieving and its claimed effects. Prefers the term "low-temperature annealing" and indicates its metallurgical importance for certain types of welded structures. Heat treatment for removal of residual stresses is justifiable only if there is definite danger of stress corrosion, or if the material is known to be in a notch brittle condition at the temperature prevailing during fabrication or in service.

18B-195. Better Silicon Irons. T. Waterfall. *Machinery Lloyd* (Continental Edition), v. 21, Oct. 1, 1949, p. 65, 67.

Development. Nitriding results in a large measure of control of crystal growth. Development of optimum controlled-atmosphere heat treating.

18B-196. Precision Hardening High Speed Tool Steels. Norbert K. Koebel. *Iron Age,* v. 164, Oct. 6, 1949, p. 86-90; Oct. 13, 1949, p. 80-85.

First part shows how bright hardening of high speed tools, with complete absence of carburization and decarburization, is possible in the L-shaped furnace, accompanied by significant production cost savings. Construction and operational features of this controlled atmosphere unit. Concepts concerning theory and application of atmospheres for precision hardening. Metallurgical results, obtained from the quenching phase, compared with air, oil, salt, and lead quench techniques.

18B-197. Buick Uses Localized Heat To Harden Small Parts. H. A. Maloney. *American Machinist,* v. 93, Oct. 20, 1949, p. 71-73.

Equipment and procedures.

18B-198. Deep Case Gas Carburizing of Nash Gears. *Industrial Heating,* v. 16, Oct. 1949, p. 1714-1716, 1718, 1720, 1722, 1724, 1883-1886.

Equipment and procedures.

18B-199. Electric Furnace Annealing Malleable Iron Castings at the Oliver Corporation. R. C. Cox. *Industrial Heating,* v. 16, Oct. 1949, p. 1728-1730, 1732, 1878.

Equipment and procedures.

18B-200. Selective Hardening of Gear Shift Rails in Automatic Machine. Joseph Geschelin. *Automotive Industries,* v. 101, Nov. 1, 1949, p. 36-37.

Induction hardening is applied in a continuous and automatic cycle at the rate of 400 pieces an hour in each of two units.

18B-201. Thermal Treatment; German Forgings, Castings, and Armour Plate. (Concluded.) *Iron and Steel,* v. 22,

Oct. 1949, p. 466. Condensed from Section 6, BIOS Overall Report No. 15, "German Ferrous Metal Industry".

Roller and ball bearings and treatment for springs. Quenching directly from rolling, nitriding, and other treatments.

18B-202. Alcuni dati sul trattamento termico dell'acciaio at 2% C e 13% Cr. (Some Data on Heat Treatment of Steel Containing 2% C and 13% Cr.) C. Sapengno and G. Magliano. *La Metallurgia Italiana,* v. 41, Mar.-Apr. 1949, p. 67-70.

Factors influencing the mechanical properties of steel, such as quenching temperature, annealing temperature, and time of annealing.

18B-203. Zur Frage der Stahlhärtung, besonders zur Kinetik der Umwandlungen. (Problems in the Hardening of Steel, Especially Kinetics of the Transformations Involved.) Frånz Wever. *Stahl und Eisen,* v. 69, Sept. 15, 1949, p. 664-670.

Work done in the Kaiser-Wilhelm Institut für Eisenforschung from 1920 to 1940. New practical methods of steel hardening and prospects of "intermediate-stage" annealing. 32 ref.

18B-204. Low-Temperature Treatment of High Speed Tools. (In Russian.) A. P. Gulyaev, P. P. Grudov, and A. A. Badaeva. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Mar. 1949, p. 3-6; Apr. 1949, p. 16-18.

The influence of low-temperature treatment on the cutting properties of tools. Application of very low temperatures, down to −100° C., immediately after heat treatment. Comparative data for different toolsteels.

18B-205. Concerning the Multiple Tempering of Low-Tungsten High Speed Steels. (In Japanese.) Masazo Okamoto and Mituru Nagakura. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Apr. 1949, p. 37-39.

Multiple tempering gives superior results with respect to hardness and tool life, especially for high-cobalt steels. Multiple and single tempering of low-tungsten, high speed steels. Effects of Al, V, and Ti on the latter were also studied.

18B-206. Salt-Bath Hardening Increases Churn-Drill Bit Life. Carrol A. Quam. *Mining Engineering* (Feature and News Section), v. 1, Nov. 1949, p. 38-39.

Operation as conducted at the titanium and iron mine of National Lead Co. at Tahawus, N. Y.

18B-207. Keep Up With Tooling. *Production Engineering & Management,* v. 24, Nov. 1949, p. 63.

Set-ups for selective induction hardening tips of valve stems and for automatically gaging valve-stem guides.

18B-208. Induction Hardening. Frank W. Curtis. *Modern Machine Shop,* v. 22, Oct. 1949, p. 124-126, 128, 130, 132, 134, 136, 138, 140, 142, 144, 146, 148; Nov. 1949, p. 144-146, 148, 150, 152, 154, 156, 158, 160, 162, 164, 166, 168.

Oct.: fundamentals for heating and quenching of steel parts. Nov.: steels best adapted to the induction hardening process, proper methods of quenching induction heated workpieces, and progressive hardening.

18B-209. New Machine Flame-Hardens Metal Parts. *Compressed Air Magazine,* v. 54, Nov. 1949, p. 286-287.

Machine made by Cincinnati Milling Machine Co., and some typical setups and pieces hardened in it.

18B-210. Stress Relief Heat Treatment of Alloy Cast Iron. *Foundry Trade Journal,* v. 87, Oct. 13, 1949, p. 457-462, 471.

Discussion, authors' reply, of paper by M. M. Hallett and P. D. Wing.

18B-211. Inter-Crystalline Failure of Bullet-Proof Armour Plate. B. R. Nijhawan. *Journal of Scientific & Industrial Research,* v. 8, Sept. 1949, p. 360-369.

Investigation to determine causes of failure. Recommendations for modification of heat treating procedure.

18B-212. High-Speed Steels; Their Manipulation and Heat Treatment. H. W. Pinder. *Alloy Metals Review,* v. 7, Sept. 1949, p. 2-8.

Includes rolling, forging, etc. Photomicrographs show structures involved.

18B-213. Residual Stresses of Fe-Ni Alloys Variously Heat Treated. (In Japanese.) Keizo Iwase and Tadao Sano. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 17-21.

Fe-Ni alloys (3-30% Ni) were cooled from 1050° C. to room, ice-water, or liquid-air temperatures at various rates. Stresses were measured by dissolving one side of the specimen layer by layer and measuring the exact change in length. Conclusions with respect to stress and structural changes are summarized in English.

18B-214. Changes of Dimensions and Shapes of Fe-Ni Alloys Variously Heat Treated. (In Japanese.) Tadao Sano. *Nippon Kinzoku Gakkai-Si* (Journal of the Japan Institute of Metals), v. 13, Jan. 1949, p. 22-25.

Experimental results obtained with eight alloys containing 6.0-31.6% Ni. Correlation with phase transformations.

18B-215. Selection of Steel for Automobile Parts. What Engineers Should Know Today About Hardenability-Band Steels. Part IV. Hardenability Selection Methods. *SAE Journal*, v. 57, Nov. 1949, p. 39-48.

Charts show details of procedure. Variations of structure with hardness are illustrated by photomicrographs. (To be continued.)

18B-216. Articulation of Alloy Steel Fixtures to Withstand Quenching Stresses. I. George C. McCormick. *Industrial Heating*, v. 16, Oct. 1949, p. 1782, 1784, 1786, 1788, 1790, 1792-1793.

Design of quenching trays and fixtures. Principles applied to rigid trays. Such devices as rounded corners and offset intersections result in much greater ability to withstand stresses. "Articulated" trays consist of several parts joined with flexible joints.

18B-217. Automatic Induction Hardening Speeds Dodge Output. Charles H. Wick. *Machinery* (American), v. 56, Nov. 1949, p. 194-198.

Various applications of selective surface hardening by means of induction heating, which have resulted in faster heating and minimum distortion and scaling.

18B-218. First-Stage Annealing of Malleable Iron. J. E. Rehder. *Canadian Metals and Metallurgical Industries*, v. 12, Oct. 1949, p. 20-22, 25.

How time necessary for first-stage annealing of blackheart malleable can be calculated from temperature and silicon content.

18B-219. Some Factors Involved in the Hardening and Tempering of Steel. *Metallurgia*, v. 40, Oct. 1949, p. 308-312.

Based on lecture by Morris Cohen. Includes transformation diagrams and graphs.

18B-220. Die autogene Oberflächenhartung; La trempe superficielle au chalumeau. (Surface Flame Hardening.) (Concluded.) H. Bauer. *Zeitschrift für Schweisstechnik; Journal de la Soudure*, v. 3, Mar. 1949, p. 47-51.

Hardening of cast iron and cast steel; adjustment of the burner and quenching spray; method of controlling depth of hardness; pre and post treatment of steel for optimum results.

18B-221. Das Gasglühfrischen von Temperrohguss. (Gas Annealing of Malleable Cast Iron.) Walter Baukloh. *Chemische Technik*, v. 1, Aug. 1949, p. 41-50.

Process can be performed without the usual charge of ore and sand, and physicochemical data indicate that the carbon content of the iron can be easily controlled by using the proper gas mixtures at suitable temperatures. Transformations in the Fe-O-C and Fe-C-H systems, effects of alloying elements, and decarburization in different gases. 12 ref.

18B-222. An Evaluation of Quenching Oils by Means of the End Quench Test. C. A. Siebert and G. Sandoz. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 176, 1948, p. 416-421; discussion, p. 421-423.

Previously abstracted from *Metals Technology*. See item 18b-59, 1948.

18B-223. Secondary Hardening of Tempered Martensitic Alloy Steel. W. Crafts and J. L. Lamont. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 471-512.

Previously abstracted from *Metals Technology*. See item 18b-144, 1948.

18B-224. Temper Brittleness of Plain Carbon Steels. L. D. Jaffe and D. C. Buffum. *Transactions of the American Institute of Mining and Metallurgical Engineers*, v. 180, 1949, p. 513-518.

Previously abstracted from *Metals Technology*. See item 18B-1, 1949.

18B-225. Induction Heating Medium Carbon Steels. *Iron Age*, v. 164, Nov. 24, 1949, p. 76.

Based on "The Effect of Alloying Elements on the Transformation Characteristics of Induction Heated Steels", Joseph F. Libsch, Wen-Pin Chuang, and William J. Murphy. Previously abstracted from *American Society for Metals*, Preprint 21, 1949. See item 18B-168, 1949.

18B-226. The Carbonitriding Process of Case Hardening Steel. G. W. P. Rengstorff, M. B. Bever, and C. F. Floe. *Metal Progress*, v. 56, Nov. 1949, p. 651-656:

Effects of temperature and time on the composition and structure of the carbonitrided case. Some effects of variation in the gas composition, and advantages of carbonitriding over other case hardening processes.

18B-227. How to Heat Treat Chisel Steel. Arthur Walten. *American Machinist*, v. 93, Dec. 1, 1949, p. 85.

Recommended procedure.

18B-228. Oxy-Acetylene Flame Hardening in Commercial Heat Treatment. H. T. Howat. *Welding Journal*, v. 28, Nov. 1949, p. 1043-1052.

Methods, and materials which may be flame hardened. Typical applications.

18B-229. Carbon Steels; New Atmosphere for Decarburization-Free Treatment. P. F. Hancock. *Iron and Steel*, v. 22, Nov. 1949, p. 509-512.

Use of endothermic generator developed in the U. S. for production of atmosphere from city gas and air over a catalyst. Potential applications.

18B-230. Les recherches sur la trempe isotherme en France et à l'Etranger. (Research on Isothermal Hardening in France and Abroad.) (Concluded.) G. Delbart and M. Ravery. *Revue de Métallurgie,* v. 46, July 1949, p. 475-502.

Intermediate transformations, martensitic transformations, incubation, high speed steels, and relations between structure and mechanical properties. 162 ref.

18B-231. Homocarb Gas Cyaniding. *Western Metals,* v. 7, Nov. 1949, p. 35-37.

With the "Homocarb" furnace, heat treaters case harden parts made of low-carbon steel to specific dimensions. How the method works at two western plants.

18B-232. Induction Hardening of High Speed Steel Tools. (In Russian.) L. S. Livshits. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 27.

Optimum conditions for induction heat treatment of tools produced from high speed toolsteel. Comparative data for standard hardening and induction hardening of such toolsteels.

18B-233. Variations in the Quenching Power of Salt Baths. A. M. White. *Metal Progress,* v. 56, Dec. 1949, p. 819-824.

The quenching power of a commercial nitrate-nitrite salt bath is significantly increased by contamination with 0.5% sodium chromate, and decreased by small amounts of chloride. Results are based on a direct method of testing in which hardness of a stepped cylindrical specimen is used to indicate effectiveness of the medium in which the specimen is quenched. 11 ref.

18B-234. Air-Hardening Tool and Die Steels: Characteristics and Classification. C. B. Post. *Iron Age,* v. 164, Nov. 24, 1949, p. 63-67; Dec. 1, 1949, p. 91-94; Dec. 15, 1949, p. 91-95.

These steels offer greater freedom from cracking—especially in intricate sections—less distortion in heat treatment, a minimum of size change, and uniform through-hardening. Nov. 24 issue: General characteristics of the steels, which are separated into three classifications based on analysis and usage. Dec. 1 issue: Distortion factors, hardenability, and internal stresses resulting from water, oil, and air hardening. Concluding part: Typical applications.

18B-235. Scale Reduction in Controlled Atmosphere Cycle Annealing. C. A. Payntor. *Iron Age,* v. 164, Dec. 15, 1949, p. 86-90.

Techniques and furnace equipment used for reducing forging scale on steel parts to machinable limits simultaneously with a cycle annealing operation. Furnace construction details, atmosphere composition, furnace cycle, production rates and operation costs involved in handling parts of A8620 composition at rates up to 3400 lb. per hr.

18B-236. Hardening and Balancing Parts for IHC's Silver Diamond Engine. *Automotive Industries,* v. 101, Dec. 15, 1949, p. 41, 78.

Equipment and procedures for engine made by International Harvester.

18B-237. Graphitization of Gray Cast Iron by Heat Treatment. A. W. Silvester. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 51-65; discussion, p. 65.

Previously abstracted from preprint. See item 18B-62, 1949.

18B-238. Effects of Temperature and Silicon Content on First Stage Annealing of Black-Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 173-177; discussion, p. 177-180.

Previously abstracted from preprint. See item 18B-74, 1949.

18B-239. Graphitizing Behavior of White Iron. S. C. Massari. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 226-231; discussion, p. 231-232.

Previously abstracted from *American Foundryman,* item 18B-92, 1949.

18B-240. Surface Hardening of Pearlitic Malleable Irons. S. H. Bush, W. P. Wood, and F. B. Rote. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 367-376; discussion, p. 376-377.

The above, varying widely in chemical composition, production practices, and microstructures were investigated for response to surface-hardening heat treatments. Flame and induction heating followed by oil, water, or spray quenching were used. Case hardness and depth were determined by Rockwell C measurements and metallographic examination of etched specimens.

18B-241. Influence of Rate of Heating on First Stage Graphitization of White Cast Iron. Richard Schneidewind and D. J. Reese. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 497-505; discussion, p. 505-508.

Previously abstracted from preprint. See item 18B-76, 1949.

18B-242. Influence of Silicon Content on Critical Temperature Range During Slow Cooling of Black-Heart Malleable Iron. J. E. Rehder. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 549-555; discussion, p. 555-557.

Previously abstracted from preprint. See item 18B-75, 1949.

18B-243. Controlled Atmosphere Annealing of Malleable Iron. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 562-564; discussion, p. 564-566.

Previously abstracted from preprint. See item 18B-61, 1949.

18B-244. Untersuchungen von Härteschwankungen durch statistische Verfahren. (Study of Hardness Measurements by Statistical Methods.) Otto Henstenberg. *Stahl und Eisen,* v. 69, Oct. 27, 1949, p. 765-767.

Statistical analysis was made of hardness variations with time of surface-hardened and quenched steels and of "degree of coincidence" of parallel hardness curves.

18C—Nonferrous

18C-1. How to Heat Treat Beryllium-Copper. John T. Richards. *Iron Age,* v. 163, Feb. 24, 1949, p. 78-84.

Recommendations covering hardening procedures, including handling techniques. Comprehensive physical-property data. Equipment requirements.

18C-2. Intergranular Weakness in Cartridge Brass. Fred M. Arnold. *Metal Progress,* v. 55, Feb. 1949, p. 158-162.

During production of 3-in., 50-cal. brass cartridge cases, cracks were found in discs from one mill. Experiments indicate that gas absorbed during melting and casting may be the cause. How the trouble was eliminated by an appropriate annealing schedule.

18C-3. Etude thermomagnétique des modifications structurales déterminées par revenu apres hypertrempe dans quelques ferronickels complexes. (Thermomagnetic Study of Structural Modifications Caused by Annealing After Quenching From High Temperatures (1000° C.) of Certain Complex Ferronickels.) Emile Josso. *Comptes Rendus* (France), v. 227, Dec. 20, 1948, p. 1369-1371.

Method of investigation used on a ferronickel containing 77.5% Ni, 3.6% Mo, 0.02% C, balance Fe. The method permits the qualitative and quantitative study of structural rearrangements caused by heat treatment.

18C-4. The Experiments of Boas and Honeycombe on Internal Stresses Due to Anisotropic Thermal Expansion of Pure Metals and Alloys. F. P. Bowden. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 275-280; discussion, p. 432-462.

When noncubic metals and alloys are subjected to repeated cycles of heating and cooling, surface cracks and slip lines are observed. With cubic metals, such as lead, this does not occur. The effect is attributed to internal stresses set up by anisotropy of thermal expansion. Several experiments which support this hypothesis, and effect on casting and annealing. 11 ref.

18C-5. "Hy-Therm" Copper—An Improved Conductor. L. F. Hickernell, A. A. Jones, and C. J. Snyder. *Electrical Engineering,* v. 68, May 1949, p. 402. Digest of "Hy-Therm Copper—An Improved Overhead-Line Conductor," to be published in *AIEE Transactions,* v. 68, 1949.

Annealing characteristics of hard drawn copper wire as affected by chemical composition; heat and time —with and without tension; intermittent heating; and manufacturing technique.

18C-6. Ruckbildungsversuche an einer Kupfer-Beryllium-legierung. (Annealing Tests on a Copper-Beryllium Alloy.) H. Unkel. *Metall,* Oct. 1948, p. 319-324.

Effects of different annealing temperatures and times on the hardness, tensile strength, yield point, elongation, and specific resistance of drawn, forged, hot and cold rolled samples of a Be-Ni-Cu alloy. 10 ref.

18C-7. Investigation of Conditions of Titanium Carbonization. IV. G. A. Meerson and Y. M. Lipkes. *National Advisory Committee for Aeronautics,* Technical Memorandum 1235, July 1949, 13 pages. Translated from *Zhurnal Prikladnoi Khimii* (Journal of Applied Chemistry), v. 18, no. 4-5, 1945.

Thermodynamic calculations confirming results of previous experiments at atmospheric pressure and additional experiments at reduced pressures.

18C-8. The Bright Annealing of Copper in Continuous Controlled Atmosphere Furnace. J. H. Bradley and H. J. Hammond. *Industrial Heating,* v. 16, July 1949, p. 1158-1161, 1292.

As applied to wire, strip, and bar stock of copper and nonferrous Cu alloys.

18C-9. Some Factors Affecting the Rate of Precipitation Hardening in Cu-Be Alloys. Paul A. Beck. *Journal*

of Applied Physics, v. 20, July 1949, p. 666-668.

It was found that the lower peak hardness and faster overaging of a Co-containing Cu-Be alloy quenched from a low solution-treating temperature is associated with a large amount of grain-boundary precipitation. A similarly large amount coupled with low peak-hardness is obtained if the alloy contains a small amount of Cr impurity, even if the quenching temperature is normal.

18C-10. Hydrogen in Cathode Nickel. M. G. Corson. *Metal Progress,* v. 56, Sept. 1949, p. 360, 386.

Experimental data on effects of annealing at various temperatures on mechanical properties. Hydrogen was found to be responsible for increased ductility.

18C-11. Some Effects of Heating Zirconium in Air, Oxygen, and Nitrogen. E. T. Hayes and A. H. Roberson. *Journal of the Electrochemical Society,* v. 96, Sept. 1949, p. 142-151.

Observations were made from 425 to 1300° C. on gain in weight, micro and macrohardness, and metallographic structures. Practical limits for heating and possibilities of producing hard surface coatings. 11 ref.

18C-12. High Strength Nickel Alloy Retains Performance Properties at High Temperatures. C. A. Crawford. *Materials & Methods,* v. 30, Oct. 1949, p. 57-61.

Unusually high strength at ordinary temperatures and at red heat is obtained by suitable heat treatment of Inconel X. Miscellaneous properties and applications.

18C-13. Decarburization of Chrome Nickel Alloys by Their Surface Oxides in High Vacua and at Elevated Temperatures. E. A. Gulbransen, W. S. Wysong, and K. Andrew. *Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 180, 1949, p. 565-578.

Previously abstracted from *Metals Technology.* See item 18c-7, 1948.

18C-14. Bright Annealing of Nickel Silver Accomplished on Production Basis. John W. Carter. *Materials & Methods,* v. 30, Dec. 1949, p. 56-58.

Scale-free, clean metal surfaces can be maintained during stress-relief annealing by careful selection of atmosphere and furnace equipment.

18D—Light Metals

18D-1. Uber die Weiterentwicklung des Heterogenisierungs-Verfahrens von Al-Mg-Legierungen zur Verbesserung der Spannungskorrosionsbeständigkeit. (Further Development of Heterogenization of Al-Mg Alloys For the Purpose of Increasing Stress-Corrosion Resistance.) G. Siebel and G. H. Voss-Kuhler. *Metall,* May 1948, p. 141-146.

An improved method consists of aging at 100-200° C. of strongly cold worked sheet metal mainly in the range of recrystallization, so controlled that only the first stages of recrystallization take place and so that the intermetallic Al_3Mg_2 crystals segregate in coagulated form. Micrographs, and X-ray diffraction and X-ray photographs.

18D-2. Uber den Einfluss der Abschreckgeschwindigkeit auf das Spannungskorrosionsverhalten von Aluminium-Kupfer-Magnesium und Aluminium-Zink-Magnesium-Legierungen. (The Effect of Quenching Rate on the Stress-Corrosion Properties of Aluminum-Copper-Magnesium and Aluminum-Zinc-Magnesium Alloys.) Gustav Siebel. *Zeitschrift fur Metallkunde,* v. 39, Feb. 1948, p. 57-64.

Effects of heat treatment, quenching medium, and quenching rate. 13 ref.

18D-3. Heat Treatment of Aluminum Casting Alloys. R. E. Spear and L. J. Ebert. *Iron Age,* v. 163, Mar. 3, 1949, p. 88-95; Mar. 10, 1949, p. 110-117.

Results of a correlated, comprehensive literature study covering four alloy types. Emphasis is placed on Al-Cu alloys, in the first part, with data indicating the influence of various heat treating variables on physical properties. Concluding installment deals with the Al-Si, Al-Mg, and Al-Si-Mg alloys. 22 ref.

18D-4. Why Does 75S-T Often Misbehave? C. W. Alesch. *American Machinist,* v. 93, Mar. 10, 1949, p. 88-90.

75S-T requires suitable heat treatment or it may quench crack or warp in machining. Recommended shapes to avoid these troubles.

18D-5. Re-Solution Treatment of Aluminium Alloys. Paul W. Boone. *Aircraft Engineering,* v. 21, Feb. 1949, p. 56-57.

A method of improving the formability of high-strength aircraft alloys consists of heating for a short time in the precipitation heat treatment temperature range. Specific schedules for clad 14S and 24S alloys. Includes aging time vs. elongation and strength curves.

18D-6. Note sur les phénomenes observés apres traitement a haute température sur l'Aluminium de haute pureté et sur un alliage a 4% de Cuivre polis électrolytiquement. (Note on Phenomena Observed After Heat

Treatment at High Temperatures of High-Purity Aluminum and an Electropolished Aluminum Alloy Containing 4% Copper.) Marie L. V. Gayler. *Journées des Etats de Surface,* 1946, p. 82-84; discussion, p. 84.

Investigation revealed the growth of grains on the surface layer after quenching from high temperatures. Mechanism of this phenomenon.

18D-7. Thermal Treatment of Aluminum Alloys. E. H. Dix, Jr. *American Society for Metals,* "Physical Metallurgy of Aluminum Alloys," 1949, p. 200-240.

Summarizes objectives; describes terms; and discusses treatments under the headings: annealing; recovery; preheating; solution heat treatment; quenching; aging; and reheating. Effects of thermal treatment on corrosion resistance and an explanation of the Alcoa temper designation for cast and wrought products. 36 ref.

18D-8. The Influence of Over-Ageing and Annealing on the Hardness and Microstructure of an Aluminium Alloy to British Standard Specification L42. W. Betteridge, C. Wilson, M. A. Haughton, and W. Morgan. *Journal of the Institute of Metals,* v. 75, Apr. 1949, p. 641-664.

Effects of temperatures between 150 and 400° C. were investigated, with the object of deriving the operating temperature of engine components from subsequent hardness and microscopic determination. Variations of lattice parameter with change in annealing conditions. Results support a tentative explanation of the various phenomena based on present theories of age-hardening.

18D-9. La funzione del tempo di preriscaldo nella tempra di soluzione delle leghe leggere da fonderia. (Duration of Preheating in Solution Quenching of Cast Light Alloys.) C. Panseri. *Alluminio* v. 18, Jan.-Feb. 1949, p. 7-20.

Test results for Al-Si-Mg, Al-Cu-Si, and Al-Cu-Fe-Mg cast alloys, showing the effect of the above on mechanical properties. Attempts to find a theoretical exnlanation of the curves of these properties vs. duration of preheating.

18D-10. Aluminum Wire. Section IV. Heat Treatments of Aluminum Alloy Wire. D. C. G. Lees. *Wire and Wire Products,* v. 24, June 1949, p. 494-497; discussion, p. 497, 543-544.

Metallurgical considerations, procedures, and furnaces.

18D-11. The Effect of Quenching on the Age Hardening of Two Aluminum Alloys. R. D. Barer and M. B. Bever. *Journal of Metals,* v. 1, sec. 3, Aug. 1949 (*Metals Transactions,* v. 185), p. 544-552.

Two Al alloys were aged at various temperatures after quenching from the solution treatment directly to the aging temperatures and also after first quenching into water. Progress of the aging reaction was followed by electrical resistance and hardness measurements. 22 ref.

18D-12. Etude de la trempe d'un alliage léger du point de vue élastique. (Study of the Quenching of a Light Alloy From the Point of View of Elasticity.) Charles Appert and Robert Cabarat. *Comptes Rendus* (France), v. 228, June 13, 1949, p. 1871-1873.

Investigated for high-strength Al alloys (7-8.5% Zn, 1.75-3% Mg, 1.0-2.0% Cu, 0.1-0.6% Mn, 0.2-0.4% Cr). Internal friction increases rapidly to a maximum during the early part of the aging process, apparently because of heterogenization of the solid solution prior to precipitation of a new phase. After this point, internal friction decreases gradually. The variation of Young's modulus follows that of hardness. Modulus of elasticity is apparently influenced only slightly by changes in structure.

18D-13. Über die Stabilität einer Al-Mg-Zn-Legierung mit 4,5% Zn u. 3,5% Mg (Hy 43). [The Stability of an Al-Mg-Zn Alloy With 4.5% Zn and 3.5% Mg (Hy 43).] H. Vosskühler. *Archiv für Metallkunde,* v. 3, July 1949, p. 262-264.

Stability was determined by measuring the electrical resistance of the alloy age-hardened at different times and temperatures and comparing results with those for an Al-Cu-Mg alloy. Stability is found to decrease with increasing age-hardening temperature, and tensile strength is not materially affected at temperatures below 60-70° C.

18D-14. Effects of Quenching Rate and Quench-Aging on the Tensile Properties of Aluminum Alloy 61S. R. C. Lemon and H. Y. Hunsicker. *American Society for Metals,* Preprint No. 34, 1949, 17 pages.

Object was to determine the merits of a heat treating procedure termed quench-aging, compared with conventional quenching and aging. Sections of sheet or plate 0.083-2¼ in. thick were solution heat treated at 970° F. and quench-aged in molten salt at 320, 360, and 400° F. Similar specimens were solution-treated, quenched in various media, and artificially aged at the same temperatures.

18D-15. Simultaneous Aging and Deformation in Metals. J. D. Lubahn. *Journal of Metals* (Transactions Section), v. 1 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), Oct. 1949, p. 702-708.

Constant strain rate tensile tests, constant load creep tests, and variable strain rate tensile tests were carried out on an age hardenable Al alloy.

18D-16. Step Aging of a Magnesium-Base Casting Alloy. E. J. Vargo and G. Sachs. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 567-573; discussion, p. 573.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-3. See item 18d-4, 1948.

SECTION XIX

WORKING

19A—General

19A-1. The Handling of Webs and Monofilament Materials. Part II. C. A. Litzler. *Wire and Wire Products,* v. 23, Dec. 1948, p. 1131-1133, 1176.

Equipment for handling strand and monofilament materials during processing, such as extrusion forming; extrusion jacketing of wire; and dipping impregnation or coating.

19A-2. The Y-Cold Strip Mill. A. I. Nussbaum. *British Steelmaker,* v. 14, Dec. 1948, p. 571-573.

Design and merits of the above, with its small diameter rolls.

19A-3. Designing of "Trouble-Free" Dies. Part LXXXVIII. Drawing Presses. C. W. Hinman. *Modern Industrial Press,* v. 10, Dec. 1948, p. 18.

Operating presses by means of a rack-and-pinion; toggle drawing presses.

19A-4. Presses Produce Variety of Products at Buyken Machine. Howard E. Jackson. *Modern Industrial Press,* v. 10, Dec. 1948, p. 36, 38, 40.

Production of simple and complicated stampings of all kinds, and from the very small to the large.

19A-5. Modern Airplane Sub-Assembly Methods at Air Metals, Inc. *Modern Industrial Press,* v. 10, Dec. 1948, p. 44, 46, 48-49.

Miscellaneous press operations.

19A-6. The Inspection and Maintenance of Diamond Wire-Drawing Dies. *Industrial Diamond Review,* New ser., v. 8, Nov. 1948, p. 325-329.

Recommended procedures.

19A-7. Greater Capacity Presses Increase Possibilities for Stretch Forming. J. J. Sloan. *Automotive Industries,* v. 99, Dec. 15, 1948, p. 36-40, 58.

The stretch forming of various typical shapes from sheet metal. New Hufford stretch presses.

19A-8. Forging Die Design. Waldemar Naujoks. *Tool Engineer,* v. 22, Jan. 1949, p. 17-20.

Fundamental principles. Die-sinking procedures are not included unless needed to illustrate particular points.

19A-9. Contour Forming of Curved Parts. Cyril J. Bath. *Tool Engineer,* v. 22, Jan. 1949, p. 24-25.

Operation and applications of contour-forming machinery.

19A-10. Werkstoffeinsatz und optimale Leistungsausnutzung von pressdornen fur Metallrohrpressen. (Recommended Plunger Materials and Procedures for Extrusion of Metal Tubes.) H. Assmann. *Metall,* Apr. 1948, p. 106-114; May 1948, p. 153-157.

Properties of the various steels used for the above, indicating those considered desirable. Production and heat treating methods. Includes drawings of matrices and dies.

19A-11. Rolled Bars. Part II. Application of Spread Calculation to Pass Design. A. E. Lendl. *Iron and Steel,* v. 21, Dec. 1948, p. 601-604.

In Part I it was shown that the spread of a rolled bar of nonrectangular cross-section entering a groove with non-parallel roll surfaces can be calculated with an accuracy more than sufficient for production. In Part II prints of samples from actual production are used to verify the method of calculation. Diagrams of spread factors for the layout of oval grooves. An example of the layout and design of an entire sequence of square-oval grooves.

19A-12. A New Theory of the Plastic Deformation in Wire-Drawing. Part II. (Concluded.) R. Hill and S. J. Tupper. *Wire Industry,* v. 15, Dec. 1948, p. 811-813.

Previously abstracted from *Journal of the Iron and Steel Institute.* (See item 19a-195, 1948.)

19A-13. Progressive Piercing, Punching, and Forming Dies. Charles R. Cory. *Machinery* (American), v. 55, Jan. 1949, p 152-155.

Types of progressive forging dies

that have proved satisfactory for both manual and automatic feed. (To be concluded.)

19A-14. Bending Tubing and Moldings. *American Machinist,* v. 93, Jan. 13, 1949, p. 137.

Method utilizing Cerrobend, a low-melting-point Bi alloy, as temporary filler material.

19A-15. Resistance Strain Gauges for the Measurement of Roll Force, Torque, and Strip Tension. J. Rankine, W. H. Bailev, and F. P. Stanton. *Journal of the Iron and Steel Institute,* v. 160, Dec. 1948, p. 381-387.

Methods of measuring roll-separating force, spindle torque, and strip tension in the 10 x 10 in., two-high, experimental cold-rolling mill at Sheffield University.

19A-16. Laminated Plastic Bearings for Heavy Duty and Severe Service. E. P. Littlefield. *Product Engineering,* v. 20, Jan. 1949, p. 111-115.

Applications include roll-neck bearings for metal-rolling mills, and other heavy-duty uses.

19A-17. Ultra-Depth Drawing of Sheet Stock. Frank Charity. *Modern Industrial Press,* v. 11, Jan. 1949, p. 6, 8, 51-52.

Draws as deep as 9 in. have been produced in a single press operation from alloys such as 2S-0, 3S-0, and 3S-½H without special dies or preheating. Such operations are made possible by use of a new-type petroleum-base lubricant.

19A-18. Designing of "Trouble-Free" Dies. Part LXXXIX. Types of Presses, Their Uses and Capacities. C. W. Hinman. *Modern Industrial Press,* v. 11, Jan. 1949, p. 20.

Hydraulic drawing presses of different types.

19A-19. Speedy Airplane Sub-Contracting at Sulak Manufacturing Co. Howward E. Jackson. *Modern Industrial Press,* v. 11, Jan. 1949, p. 48, 50.

Press and machining operations in manufacture of small parts.

19A-20. Eliminating Defects Through Improved Rolling Methods. J. A. Tischbein. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 57-62; discussion, p. 62-65.

How changing pass design and procedure reduces defects due to seams, and increases tonnage and yield of rolled steel products.

19A-21. An Investigation Into the Inhomogeneity of Deformation in Wire Drawing and Rolling. June Collins and R. W. K. Honeycombe. *Journal of the Council for Scientific and Industrial Research,* v. 21, Feb. 1948, p. 59-68. (Reprint.)

A method involving microscopic detection of the beginning of recrystallization in deformed metals.

19A-22. Bibliography on Wire. *Library and Information Dept., Iron and Steel Institute* (London), Bibliographical Series No. 13, 1947, 146 pages.

Manufacture, treatment, and properties, including cold-drawing of bars.

19A-23. Wire-Drawing With Continuous Drawing Machines. S. Geleji. *Wire Industry,* v. 16, Jan. 1949, p. 53-56.

Mathematics of the above; descriptions of equipment.

19A-24. Hints for Eliminating Die Failures. S. A. Phelps. *Machinery* (London), v. 74, Jan. 13, 1949, p. 48-49.

Thirty-one recommendations for punch and die design.

19A-25. Wire-Drawing Compounds. Properties Desired—Function—Methods of Application. E. L. H. Bastian. *Metal Industry,* v. 74, Jan. 14, 1949, p. 31-33. A condensation.

19A-26. The Calculation of Stresses in the Ironing of Metal Cups. R. Hill. *Journal of the Iron and Steel Institute,* v. 161, Jan. 1949, p. 41-44.

A theory of the stresses required to iron a cup by forcing it through a die with a close-fitting internal punch. The ironing load is evaluated for a practical range of reductions and die angles. Friction and work-hardening are considered.

19A-27. Trimming Cast Parts. Arthur H. Allen. *Foundry,* v. 77, Feb. 1949, p. 84-86.

Use of punch presses for the above at Ford Motor Co.

19A-28. Certain Possibilities of Increase of Productivity and Decrease of Defects During Cold Rolling. (In Russian.) V. I. Beloshabskii. *Promyshlennaya Energetika* (Industrial Power), v. 5, Oct. 1948, p. 11-13.

A new electrical device for maintaining constant tension of the formed strip. Electrical circuit diagrams and performance curves.

19A-29. The Routine Checking of Crank Presses. K. L. Jackson. *Sheet Metal Industries,* v. 25, July 1948, p. 1353-1354.

Recommended procedures.

19A-30. Some Fundamental Considerations Relating to the Deep Drawing of Metals. A. R. E. Singer. *Sheet Metal Industries,* v. 25, July 1948, p. 1387-1393, 1400.

Previously abstracted from *Steel Processing.* See items 19a-234 and 19a-248, 1948.

19A-31. Manufacturing Methods Used for the Quantity Production of the

Cookson Lock Joint. J. B. Clegg. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1585-1591, 1614.

Forming methods used for large-scale production of the above. Mathematics of pattern development. Use in assembly of finished products.

19A-32. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1592-1600; Dec. 1948, p. 2421-2427.

Aug: punch guidance by stripper plate, pillar-type press tools, top punch plate bushings, design and fixture of guide pillars, punch misalignments due to faulty punching, application of "shear" to punch and die, forms of "shear", and maintenance requirements of "shear" tools. Dec.: piercing tools, their design, and maintenance requirements. (To be continued.)

19A-33. The Application of Deep Drawing and Pressing to Gas Turbine Engines. H. E. Lardge. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1603-1608.

Components produced using mild steel; 18-8 stainless; and an 80% Ni, 20% Cr alloy.

19A-34. Cold Rolling Technique. I. Explanation of Terms and Theories Used in the Literature of Rolling. II. The Effect of Speed on Cold Rolling Practice. Hugh Ford. *Sheet Metal Industries,* v. 25, July 1948, p. 1327-1336, 1344; Aug. 1948, p. 1545-1549; Sept. 1948, p. 1757-1762; Oct. 1948, p. 1973-1978; Nov. 1948, p. 2189-2197; Dec. 1948, p. 2405-2411, 2418.

Part I, July and Aug., explains terms and theories and gives a glossary. Part II concluded with Dec., deals with effect of speed on gage; effect of speed on production; effect of speed on roll force and power consumption; and a general discussion of the cause of the speed effect. (To be continued.)

19A-35. Cold Rolling Technique. III. The Effect of Strip Tension on Mill Power. Hugh Ford. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 81-86; Feb. 1949, p. 315-318.

Jan.: Energy of deformation and total mill power; estimation of power consumption on the basis of theory; sample calculation. Feb.: Experimental results for power consumption in rolling with tension.

19A-36. Notes on Metalworking and Heat Treatment in 1948. R. T. Willson. *Steel Processing,* v. 35, Jan. 1949, p. 19-20, 26.

New developments in equipment for working and heat treatment.

19A-37. Carbide Die Construction. *Steel Processing,* v. 35, Jan. 1949, p. 21-23.

Designs for various operations in the stamping, forming, and drawing of metals.

19A-38. Factors in Selecting a Drawing Lubricant. R. F. Johnston. *Steel Processing,* v. 35, Jan. 1949, p. 27-30, 43.

Advantages of graphite.

19A-39. Extrusion Press Mandrels. H. Assmann. *Metal Industry,* v. 74, Jan. 21, 1949, p. 46-50; Jan. 28, 1949, p. 69-72. Translated and condensed from *Metall,* April 1948, p. 106-114; May 1948, p. 153-157.

Previously abstracted from original. See item 19A-10, 1949.

19A-40. Forming and Closing Tube Ends by a New Process. Arthur L. Williams. *Machinery* (American), v. 55, Feb. 1949, p. 158-161.

Tubular products can be formed to various cross-sections and their ends closed at high production rates and low cost by a process in which heat is applied to the work during forming by the passage of electric current and the resistance so developed. The process can be applied to practically any metal that will conduct electrical current.

19A-41. Coining Die With Automatic Feed. Edwin Mosthaf. *Machinery* (American), v. 55, Feb. 1949, p. 199-200.

Die capable of forming 3600 washers an hour.

19A-42. Progressive Piercing, Punching, and Forming Dies. (Concluded.) Charles R. Cory. *Machinery* (American), v. 55, Feb. 1949, p. 188-193.

Multiple progressive dies; dies for producing parts of intricate shape; coil-feed drawing and blanking dies.

19A-43. Die Design for Symmetrical Brackets. Part III. (Concluded.) Hans Effgen. *Tool & Die Journal,* v. 14, Feb. 1949, p. 51-52, 54-55.

A die which produces a bracket with bends in two directions, the bends being made simultaneously. Good practice in the construction and manufacture of dies.

19A-44. Press Brake Tooling for Piercing and Notching. Ralph Weisbeck. *Tool & Die Journal,* v. 14, Feb. 1949, p. 44, 46-48, 50.

Equipment and procedures.

19A-45. Carbide Dies Set Production Records. A. Earle Glen. *American Machinist,* v. 93, Feb. 10, 1949, p. 85-88.

Various applications to sheet-metal press work. A million hits per grind is not uncommon with carbide die sets, and life expectancy is usually 20-60 times that of steel dies.

19A-46. Kaiser-Frazer's Expanded Press Shop at Willow Run. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 43, 78.

19A-47. Fundamental Principles of Drawing Dies. C. W. Hinman. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 121-124, 126, 128-130, 132.

The size of drawing radii, drawing without a blankholder, drawing concave and tapered shells, how to design drawing dies, and stresses in drawing metals. (First of a series.)

19A-48. Rolls and Rolling. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 81-84.

Various types of passes. (First of a series.)

19A-49. Practical Problems of Light Presswork Production. (Continued.) J. A. Grainger. *Sheet Metal Industries,* v. 25, July 1948, p. 1347-1352, 1354; Aug. 1948, p. 1561-1568; Sept. 1948, p. 1771-1775; Nov. 1948, p. 2201-2205; v. 26, Jan. 1949, p. 98-102.

July: general methods and equipment; Aug.: materials in common use and specific information on the drawing of mild-steel sheet and terneplate; types of defects in sheet steel; Sept.: equipment for rolling and annealing brass strip; Nov.: operations on copper and tinplate; defects in materials; Jan.: defects and the need for a reliable test for drawability and for standardization of techniques. (To be continued.)

19A-50. Shot Peening; A Survey of Modern Methods and Applications. G. T. Colegate. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 141-148, 152; Feb. 1949, p. 371-381.

Jan.: Nature of fatigue failure of metals and mechanism of shot peening. Development of the process; the shot used; equipment; and procedures. Feb.: Factors affecting intensity of peening; effect of tempering after shot peening; measurement of peening intensity; interpretation of test results; peening methods and equipment; miscellaneous applications to ferrous and nonferrous metals. 20 ref.

19A-51. Modifications to Piercing Dies to Improve Stripping. *Sheet Metal Industries,* v. 26, Feb. 1949, p. 325-330.

On piercing-type press tools, considerable difficulties and production delays are often encountered because of the tendency of slugs to stick to the end of the punch. recommended modifications.

19A-52. Rilievo delle tensioni interne in un anello a parete spessa col metodo dell'asportazione. (Relief of Residual Stresses in a Thick-Walled Ring by Mechanical Working.) Andrea Ferro. *La Metallurgia Italiana,* v. 40, Nov.-Dec. 1948, p. 233-237.

A theoretical analysis of above problem. Equations and numerical coefficients are proposed.

19A-53. Rex Engineering Co. Uses Press Brake to Open New Field. P. D. Aird. *Modern Industrial Press,* v. 11, Feb. 1949, p. 13-14, 16, 44.

Use in manufacture of television chassis.

19A-54. Designing of "Trouble-Free" Dies. Part XC. Types of Presses, Their Uses and Capacities. C. W. Hinman. *Modern Industrial Press,* v. 11, Feb. 1949, p. 18, 36.

Two sizes of a multiple horizontal drawing press.

19A-55. Press Work in "Overhaul and Repair" at Naval Air Station Located on the Shores of Lake Washington. *Modern Industrial Press,* v. 11, Feb. 1949, p. 50, 52, 54.

19A-56. A New Drawing Chart for Tubes. Yves Dardel. *Wire and Wire Products,* v. 24, Feb. 1949, p. 137-140.

New design chart for tube-drawing operations; method of its use.

19A-57. Merchant Wire Products. H. A. Caldwell and C. L. McGowan. *Wire and Wire Products,* v. 24, Feb. 1949, p. 147-149, 188-189.

History of their manufacturing development. A few typical types.

19A-58. Extrusion Presses; Electric Resistance Heating of Billet Containers. B. P. Brunt. *Metal Industry,* v. 74, Feb. 4, 1949, p. 91-93.

Advantages of electric heating as compared with other methods.

19A-59. Strain Gages Measure Roll Force, Torque and Strip Tension. *Iron Age,* v. 163, Feb. 24, 1949, p. 71. Based on report of Rolling Committee, British Iron & Steel Research Assn.

19A-60. Carbide Blocks Spin Tube Ends. H. Peppercorn. *American Machinist,* v. 93, Feb. 24, 1949, p. 81.

Converted screw machines spin to any radius less than 5 in., close ends or leave desired holes, make noses at any angle, or extrude tubes.

19A-61. Four Dies Produce Mast Sockets From Strip to Riveted Assembly. *Tool & Die Journal,* v. 14, Mar. 1949, p. 44-46, 48.

Detailed drawings of progressive dies for punch-press production of mast sockets for television antennas.

19A-62. Flame Spinning, A New Metal-Forming Method. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 143-144, 146-148.

19A-63. Press Industry Churns Forward; Shows Sizeable Postwar Growth.

Thomas A. Dickinson. *Western Metals,* v. 7, Feb. 1949, p. 24-26.
Activities of various western companies engaged in manufacture of press equipment.

19A-64. Deformation in Rolling. George S. Mican. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 53-67.
A new approach to metal-flow theory. The contour patterns developed under rolling or forging are shown to be related to the ratio of the height of stock worked to the horizontal component of the chord of the roll-contact arc.

19A-65. Metal Cabinets Formed Completely on a Press Brake. Charles H. Wick. *Machinery* (American), v. 55, Mar. 1949, p. 154-158.
Use of tangent-bending attachment permits metal cabinets to be completely formed on one machine. New method is especially suitable for production runs up to 200 cabinets a day per machine.

19A-66. Higher Output With Carbide Lamination Dies. *Machinery* (American), v. 55, Mar. 1949, p. 171-173.
Typical carbide dies for punching electric motor and transformer laminations. Advantages over steel dies.

19A-67. Water Lubrication of Phenolic Bearings. Frank Vogt. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 201-205.
The above as used on rolling mills. Fundamental principles and design sketches. (To be continued.)

19A-68. Equipment and Method Trends in Stamping Production. Harry Sahlin. *Tool Engineer,* v. 22, Mar. 1949, p. 24-25.

19A-69. Developments in Forging Practice. Waldemar Naujoks. *Tool Engineer,* v. 22, Mar. 1949, p. 33-34.
Equipment and procedures.

19A-70. Die Set for Perforating Sheet Metal. *Machinery* (London), v. 74, Mar. 3, 1949, p. 265-267.

19A-71. Progressive Piercing, Punching, and Forming Dies. C. R. Cory. *Machinery* (London), v. 74, Mar. 3, 1949, p. 270-273.
Dies used by Fisher Body Div., General Motors Corp.

19A-72. Automatic Control of Tension, Speed, and Position in Handling Metal Strip. J. H. Hopper. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 317-322, 386-388.
Apparatus for the above.

19A-73. Water Lubrication of Phenolic Bearings. Part II. Frank Vogt. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 338-341.
Recommended procedures for bearings on large machinery.

19A-74. Edge Positioner. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 341-342.
Edge position of any sheet-like material entering a process over rollers can now be controlled within limits as narrow as ± 0.05 in. by simple mechanical means and without touching the sheet.

19A-75. New Facilities at Gary Sheet and Tin Mill Offer Increased Tin Plate Capacity. *Steel,* v. 124, Mar. 28, 1949, p. 86, 103, 106, 108.
Extensive additions of new equipment and revision and replacement of existing facilities.

19A-76. The Reversing Cluster Mill. G. E. Farrington. *Iron and Steel Engineer,* v. 26, Mar. 1949, p. 69-71.
Mill enables operator to obtain the larger reductions afforded by small work rolls and at the same time retain the greater rigidity inherent in larger rolls.

19A-77. The Art of Rolling Flats. Charles P. Hammond. *Iron and Steel Engineer,* v. 26, Mar. 1949, p. 85-95; discussion, p. 95.
Rolling procedure for the production of flats with particular attention to the effect of roll design.

19A-78. Extensometer Indicates Strip Extension. G. H. Rendel. *Iron and Steel Engineer,* v. 26, Mar. 1949, p. 113.
Unique type of continuously indicating and recording extensometer for measuring the percentage of extension of strip during rolling in temper pass mills.

19A-79. Extensometer Indicates and Records Percentage of Extension on Strip Temper Pass Mill. G. H. Rendel. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 382.
See item 19A-78.

19A-80. Designing of "Trouble-Free" Dies. Part XCI. Types of Presses, Their Uses and Capacities. C. W. Hinman. *Modern Industrial Press,* v. 11, Mar. 1949, p. 22, 40.
Multiple-plunger eyelet machines.

19A-81. Quality Plate Fabrication at General American Transportation Corporation. Walter Rudolph. *Modern Industrial Press,* v. 11, Mar. 1949, p. 24, 26, 30, 32.
Forming, shearing, punching, welding, and other procedures and equipment in fabrication of railway tank cars and other large vessels in both steel and aluminum.

19A-82. Modern Press Department Speeds Production of Friden Calculating Machines. J. Delamar Harrell. *Modern Industrial Press,* v. 11, Mar. 1949, p. 34, 36, 38, 40.
Described and illustrated.

19A-83. Highly Specialized Press Production at Korry Mfg. Company. Howard E. Jackson. *Modern Industrial Press,* v. 11, Mar. 1949, p. 42, 44, 46.

Manufacture of indicator lights for both military and commercial airplanes.

19A-84. Erkenntnisstand auf dem Gebiete der Warmverformung. (Present Knowledge in the Field of Hot Working.). Theodor Dahl. *Stahl und Eisen,* v. 68, Sept. 9, 1948, p. 333-345.

An extensive summary review. 40 ref.

19A-85. Entwicklung der Walzenanstellvorrichtungen fur Feinblechwalzwerke. (Development of Roll-Adjusting Equipment for Sheet-Metal Rolling Mills.) Wilhelm Krämer. *Stahl und Eisen,* v. 69, Feb. 3, 1949, p. 86-93.

Control and adjusting devices for old and modern rolling mills.

19A-86. Residual Stresses During Flaring. (In Russian.) L. A. Glikman and V. A. Stepanov. *Kotloturbostroenie* (Boiler and Turbine Industry), Sept.-Oct. 1948, p. 29-32.

Continuation of preceding work on experimental investigation of the above. Mechanism involved.

19A-87. Practical Problems of Light Presswork Production. (Continued.) J. A. Grainger. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 531-534, 539.

New materials; possible developments and future trends. Various defects in ferrous metals as related to performance in press operations. Die steels and their recommended heat treatments. Other ferrous and nonferrous materials used, their advantages and disadvantages, including hard-faced and plated tools. (To be continued.)

19A-88. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 561-568; Apr. 1949, p. 788-796.

Deals with following specific types: die blocks (solid type), sectional or built-up die blocks, sectional die blocks for pointers, an eight-section die block, and solid-type punches. (To be continued.)

19A-89. The Art of Roll Pass Design. Ross E. Beynon. *Steel,* v. 124, Apr. 4, 1949, p. 112, 114, 117-118, 120, 123-124.

19A-90. Fundamental Principles of Drawing Dies. II. C. W. Hinman. *Machine and Tool Blue Book,* v. 45, Apr. 1949, p. 115-116, 118-120.

Drawing presses in action. A step-by-step description of the drawing of ten-gallon stock-pots (three-draw operation) applies the principles discussed in the first article.

19A-91. Estimating Upset Forgings. III-V. Albert P. Berberich. *American Machinist,* v. 93, Apr. 7, 1949, p. 135, 137, 139.

A tabulation covering stock of diameters of 1¼ to 5 13/64 in. in diam. for various lengths to upset. Diameters and lengths after 1st, 2nd, and 3rd pass.

19A-92. Dial Feeds for Punch Presses. *Machinery,* v. 55, Apr. 1949, p. 176-177.

Improved dial-feed presses are said to enable an operator to handle four to six times as much work as on conventional presses. A variety of secondary operations may be done on these presses.

19A-93. Cold Rolling Technique. IV Simplified Rolling Mill Calculations. Hugh Ford. *Sheet Metal Industries,* v. 26, Apr. 1949, p. 733-741.

Lever-arm method, with details of its theoretical development, and results of calculation compared with experimental results for 0.2% C steel and for high-conductivity copper. (To be continued.)

19A-94. Westinghouse Reports on Carbide Dies. Gilbert P. Muir. *Tool Engineer,* v. 22, Apr. 1949, p. 17-20.

Use in punch-press operations. Production records and comparative cost data.

19A-95. Dies for Swaging Operations. John Mueller. *Tool Engineer,* v. 22, Apr. 1949, p. 28-30.

Recommended designs for typical jobs.

19A-96. Design and Manufacture of Forming Rolls. A. W. Baumgartner. *Tool Engineer,* v. 22 Apr. 1949, p. 35-36.

For three typical jobs. Primary rolls are solid steel, while the inside section of finishing rolls is bronze to prevent marring or scoring.

19A-97. Rolls and Rolling. Parts III and IV. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 325-334; Apr. 1949, p. 435-441.

Part III continues description and diagrammatic representation of roll profiles. The three-high blooming mill; specialized blooming design for beam blanks; two-high continuous mill; and high-lift bloomer. Part IV discusses "ragging"—used to eliminate slipping and permit heavier drafts. The three-high billet mill. (To be continued.)

19A-98. Forging Alloys for High Temperature Service. L. S. Fulton. *Materials & Methods,* v. 29, Apr. 1949, p. 50-53.

Production of forging billets, classes of above alloys, and forging

methods and equipment. Compositions of typical Fe, Ni, and Co-base forging alloys. Applications of the different types.

19A-99. A New Process for Forming and Closing Tube Ends. A. L. Williams. *Machinery* (London), v. 74, Mar. 24, 1949, p. 383-384.

American Westin process. Equipment consists essentially of a welding transformer and a split forming die, to which electrical current is supplied by the transformer. Tubes ranging 1/16-⅜ in. wall thickness and ¾-16 in. diam. are considered to be within practical forming limits.

19A-100. Wissenschaft und Praxis im Stabziehereibetrieb. (Science and Practice in the Rod-Drawing Industry.) Fritz Boehm. *Stahl und Eisen*, v. 69, Feb. 17, 1949, p. 105-117.

Practical application of scientific theories, demonstrating flow of metal through the die. Calculates the required energy with respect to such factors as type of material, shape of die, friction, etc. The effect of area reduction, of the taper of the die hole, and of the index of friction on the "drawing energy" and on the loss of energy are expressed by Korber and Eichinger's and Siebel's approximation formulas. 33 ref.

19A-101. The Use of Hard Metals for Blanking Tools. René Champeval. *Microtecnic* (English Edition), v. 3, Jan.-Feb. 1949, p. 34-37. Translated from the German.

Advantages of use of hard metal, recommended procedures and typical tools of this type.

19A-102. Les procédés de fabrication des usines métallurgiques suisses. 5. Le laminage; Die Verarbeitungsverfahren der Schweizerischen Metallwerke. 5. Walzen. (Production Methods in Swiss Metal Works. 5. Rolling Practice.) O. H. C. Messner. *Pro-Metal*, v. 2, Feb. 1949, p. 293-303.

Different types of rolling mills and the methods of rolling ferrous and nonferrous metals.

19A-103. Researches Into the Deformation of Metals by Cold Rolling. Hugh Ford. *Institution of Mechanical Engineers, Proceedings*, v. 159, War Emergency Issue No. 39, 1948, p. 115-143; discussion, p. 153-163.

Results of a large number of experiments on an experimental cold rolling mill. The experimental technique. Two methods of determining yield stress—one depending on a tensile test, the other on a compression test. The principal theories of rolling in relation to the experimental results. A new method of rapid calculation of rolling schedules, simpler than Orowan's exact method, yet applicable when rolling with strip tension shows that there is an approximate relationship between roll force and corresponding energy of deformation. 17 ref.

19A-104. The Calculation of Roll Force and Torque in Cold Strip Rolling With Tensions. D. R. Bland and Hugh Ford. *Institution of Mechanical Engineers, Proceedings*, v. 159, War Emergency Issue No. 39, 1948, p. 144-153; discussion, p. 153-163.

From an approximate theory, equations are derived for roll force and torque with and without front and back tensions applied to the strip. Where tensions are applied, calculations for each pass take about an hour; without tensions, and using curves given in this paper, they can be carried out in 10 min. Accuracy is within about 15%. Energy relationships in rolling.

19A-105. Various Types of Safety Devices Available for Power Presses. Francis A. Westbrook. *Modern Industrial Press*, v. 11, Apr. 1949, p. 6, 8, 56-61.

19A-106. Step-By-Step Press Operations in Metal Stamping at Northern Stamping & Mfg. Co. Howard E. Jackson. *Modern Industrial Press*, v. 11, Apr. 1949, p. 26, 30, 32, 54.

Miscellaneous small-piece operations, jewelry, souvenir spoons.

19A-107. Precision Press Work Emphasized at United Air Lines' Maintenance Base. J. Delamar Harrell. *Modern Industrial Press*, v. 11, Apr. 1949, p. 50, 52.

19A-108. Punch Press Safety Device. T. E. Tyler. *Machinery*, v. 55, Apr. 1949, p. 180.

Device consists of a sleeve that surrounds the punch in operation, thus permitting the operator to place his hands close to the tool without danger. The sleeve also acts as a stripper. It is used when piercing holes in flat materials. The holes may be round, square, or irregular in shape.

19A-109. Coining Die With Automatic Feed. *Machinery* (London), v. 74, Apr. 7, 1949, p. 448-449.

A coining die capable of forming 3600 washers per hour.

19A-110. Progressive Die for Two Similar Parts. Albert Maier. *Machinery* (London), v. 74, Apr. 7, 1949, p. 455.

Arrangement said to avoid certain disadvantages of die for the same purpose described by "F.S." in the Feb. 24 issue.

19A-111. Plastic Flow in Forming and Drawing Metals. C. L. Altenburger. *Steel,* v. 124, Apr. 18, 1949, p. 88-92, 94.

Relationship of die contours to metal characteristics and the advantages and disadvantages of common tests used in estimating the drawability of steel and other metals.

19A-112. Precision Switches Guard Progressive Die. P. R. Enzler. *American Machinist,* v. 93, Apr. 21, 1949, p. 86-88.

Automatic protection equipment for stopping machining when stock feeds improperly.

19A-113. Press-Room Standards. *American Machinist,* v. 93, Apr. 21, 1949, p. 93-108.

Standards developed by Automotive Joint Industry Conference for single and double-action presses.

19A-114. Stress Peening. John C. Straub and Don May Jr. *Iron Age,* v. 163, Apr. 21, 1949, p. 66-70.

New shot-peening technique in which peening takes place simultaneously with static stressing in the same direction as the stress to be sustained in service. This can be done with different shaped pieces. Comparative mechanical-test data on SAE 9260 steel, and theory of the effect.

19A-115. The Problem of the Interaction of Tools for Mechanical Working With Plastically Deformed Bodies. (In Russian.) I. M. Pavlov. *Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk* (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Jan. 1949, p. 85-99.

Critically analyzes modern theory concerning action of the tool in machining and metal-forming operations; on the basis of Timoshenko's theory, the possibility of application of Hook's generalized law. Proposed equations interpreted for different variables.

19A-116. Improved Flying Shear Drive. J. Raymond Erbe. *Iron and Steel Engineer,* v. 26, Apr. 1949, p. 74-77; discussion, p. 77-78.

Uses a single motor directly connected to the shear, eliminating some of the usual maintenance problems.

19A-117. The Design of Dies for Wire-Drawing; Influence of Die-Shape on Deformation Energy and Friction Losses. Erich Siebel, Nikolaus Ludwig, and Paul Melchior. *Wire Industry,* v. 16, Apr. 1949, p. 339-341. Translated and condensed from *Werkstatt und Betrieb,* v. 81, July 1948, p. 177-180.

Believed by the reviewers to be the first serious attempt to utilize experimental facts compiled by investigators of all nations to establish standards for the die shape of sintered carbide dies. Develops such standards by theoretical, mathematical analysis.

19A-118. Design for Impact. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 78-80.

Specially designed, 3000-lb. forging hammer and its installation.

19A-119. Air-Operated Jigs and Fixtures. *Machinery* (London), v. 74, Apr. 21, 1949, p. 503-509.

Some interesting applications of press tools at the Barnet Instruments, Ltd., makers of all types of pressure gages.

19A-120. An Analysis of Blanking Die Designs. Part II. C. W. Hinman. *Modern Machine Shop,* v. 21, May 1949, p. 128-130, 132, 134, 136, 138, 140, 142.

Important factors which must be considered in the design of compound blanking dies and selection of die sets.

19A-121. Wire Drawing Lubricants. Charles P. Orr. *Wire and Wire Products,* v. 24, May 1949, p. 407-410, 448-451.

Fundamental differences between the above and true lubricants used on bearing surfaces. Coatings used in the drawing of wire to neutralize acid carried over from pickling, to carry the lubricant, etc. Various types of drawing lubricants, their properties and applicabilities.

19A-122. A New Theory of the Plastic Deformation in Wire-Drawing. R. Hill and S. J. Tupper. *Wire and Wire Products,* v. 24, May 1949, p. 412-417, 443-445.

Previously abstracted from *Journal of the Iron and Steel Institute,* item 19a-195, 1948.

19A-123. Heating, Forming and Bending by the Oxy-acetylene Process. William A. Thiel. *Welding Journal,* v. 28, May 1949, p. 472-473.

19A-124. Mechanism of the Rolling Process. *Metal Progress,* v. 55, May 1949, p. 714, 716, 718.

A critical summary of "Fundamental Investigations on the Hot and Cold Rolling of Metals to Sheet and Strip, With Special Reference to Aluminum, Wrought Aluminum Alloys, Electrolytic Lead, and Steels," Otto Emicke and K.-H. Lucas, *Zeitschrift fur Metallkunde,* v. 34, 1942, p. 25-38, 49-58. The steels were low-carbon types containing 15% Ni and 5% Al, respectively.

19A-125. Designing Tools for Multi-Slide Machines. P. E. McKeith. *Ma-*

chinery, v. 55, May 1949, p. 145-151.

Stampings previously requiring operations on as many as ten separate presses can be completely finished on one multi-slide machine. Modern multi-slide machines combine horizontal presses, generally equipped with progressive dies, and a four-slide forming unit. Piercing, blanking, trimming, swaging, embossing, cutting off, and various forming operations can be performed simultaneously or in any desired sequence to produce a completely formed part, or several parts, at each stroke of the machine. Successive steps in production of typical pieces.

19A-126. Controlling Temperature in Hot Metal-Working Operations. Edwin F. Mosthaf. *Machinery,* v. 55, May 1949, p. 180-181.

System in which pressure is applied to the work by dies operated through an automatically controlled air circuit. The air circuit is interconnected with a photo-electric temperature-control unit and a source of electrical power for heating the work.

19A-127. Some Factors in Carbide Die Design. George Eglinton. *Tool Engineer,* v. 22, May 1949, p. 24-28.

19A-128. Stretch-Wrap Forming at NAA. Alexander McSurely. *Aviation Week,* v. 50, May 16, 1949, p. 40-41.

Use for high-speed aircraft.

19A-129. (Book.) **Arbeitsverfahren und Betriebsmittel.** (Production Processes and Methods.) Oskar Gonner. 176 pages. Carl Hanser Verlag, Munich, Germany. 8.20 DM.

A number of methods for manufacture of pipes and tubular hollow parts. Its special merit lies in drawing attention to obsolete practices and in giving full consideration to modern methods. Emphasis is on thin-walled tubes (0.5 to 2 mm.). The various types of conical tubes, bends, distributors, and other complex shapes manufactured by fabrication from sheet metal are fully described. (From review in *Engineers' Digest*, Mar. 1949.)

19A-130. Press Brake With Tangent Bender Forms Metal Cabinets Complete. *Modern Industrial Press,* v. 11, May 1949, p. 6, 8, 10, 44.

19A-131. Presses Play Big Part in Quantity Production of Control Parts. Fred M. Burt. *Modern Industrial Press,* v. 11, May 1949, p. 40, 42, 44.

Equipment for manufacture of a wide variety of automatic pressure, temperature, and flow controllers.

19A-132. Shot Peening Process Now Part of Regular Production Operations in Many Industries. Rick Mansell. *Modern Industrial Press,* v. 11, May 1949, p. 46, 48, 50, 52.

Equipment, procedures, and miscellaneous applications.

19A-133. Stress-Strain Relationship in High-Temperature Alloys. *Industrial Heating,* v. 16, May 1949, p. 824.

Summarizes recent paper by John F. Tyrell. Relationship between stress and strain in the plastic range before necking begins is one of the factors which determine formability characteristics.

19A-134. Spanlose Werkstofformung und Bauteilgestaltung in der Feinwerktechnik. (Chip-Free Forming of Materials and Design for Precision Work.) K. H. Sieker. *Archiv fur Metallkunde,* v. 2, Mar. 1948, p. 87-93.

Methods of working and shaping materials with forming and shearing tools and dies; pressing and diecasting of synthetics; and production of parts by powder-metallurgical methods.

19A-135. Double Combination Die for Producing Two Different Parts. B. Menkin. *Machinery* (London), v. 74, May 19, 1949, p. 662-663.

A rim shell is blanked and drawn and a pronged collet is simultaneously formed and pierced on the double combination die. Details of the process.

19A-136. Cold Roll Forming of Sheet and Strip. E. J. Vanderploeg. *American Society of Mechanical Engineers,* Paper No. 49-S-3, 1949, 13 pages.

Various types of machines and products made on them. Accessory equipment. Operation of machines and production.

19A-137. Modern Seamless Tube Mills. William Rodder. *Iron and Steel Engineer,* v. 26, May 1949, p. 86-94.

Modernization of component units used in the plug-mill type of seamless-tube mill. Calculation details.

19A-138. Springs Control Forging Hammer Vibration. Rolt Hammond. *American Machinist,* v. 93, June 2, 1949, p. 98-100.

British installation.

19A-139. Roll Formed Exterior Trim. Howard A. Burleson. *Western Machinery and Steel World,* v. 40, May 1949, p. 90-91.

Fabrication of chromium-plated or stainless-steel trim strips.

19A-140. An Analysis of Blanking Die Designs. Part III. C. W. Hinman. *Modern Machine Shop,* v. 22, June 1949, p. 106-108, 110, 112.

19A-141. Seven Dies Operated Simultaneously on a Large Hydraulic Press.

George H. DeGroat. *Machinery,* v. 55, June 1949, p. 167-170.

Production of embossed escutcheon for electric range. The stamping operations performed include blanking, embossing, trimming, and piercing.

19A-142. Fundamental Principles of Drawing Dies. (Concluded.) C. W. Hinman. *Machine and Tool Blue Book,* v. 45, June 1949, p. 114-118, 120.

Press design, methods to be followed in designing a double-action die, and operation of the die.

19A-143. Progressive Drawing Die Design. Hans Effgen. *Tool & Die Journal,* v. 15, June 1949, p. 42-45, 82, 84.

Some basic characteristics. Calculation of reductions for circular parts.

19A-144. Fitting the Drawing Compound to the Job. M. J. Murphy, Jr. *Tool & Die Journal,* v. 15, June 1949, p. 48, 50.

Factors to be considered in evaluating work and selecting drawing compounds.

19A-145. The Use of Inclinable Punch Presses. J. I. Karash. *Tool & Die Journal,* v. 15, June 1949, p. 54, 56, 58, 60, 78, 80.

Safety and efficiency gained from proper use. Common misuses and peculiar features of die design.

19A-146. High-Production Presses for Short Runs. *Tool & Die Journal,* v. 15, June 1949, p. 64, 66.

Five Bliss automatics and their adaptation for short runs of different stampings.

19A-147. Harmonic Stock Feed Accessory for Multipress Presses. *Tool & Die Journal,* v. 15, June 1949, p. 74, 76.

Its operation.

19A-148. Trimming Tool Design. E. W. Mace. *Steel Processing,* v. 35, May 1949, p. 248-249.

Tools for removal of "flash"—surplus metal remaining after forging.

19A-149. Value of Surface-Active Lubricating-Cooling Liquids in the Deep Drawing of Metals. (In Russian.) S. Ya. Veiler and L. A. Shreiner. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, Jan. 1949, p. 84-87.

New method for evaluating lubricating action. Comparative data on different cooling lubricants.

19A-150. Neue Bauart einer kontinuierlichen Knuppelstrasse. (A New Design of Continuous Billet Mill.) Theodor Dahl. *Stahl und Eisen,* v. 69, Mar. 17, 1949, p. 195-196.

19A-151. Neuere Fabrikationsmethoden und Befestigungsarten von Gasturbinenschaufeln. (Recent Methods of Manufacturing Gas Turbine Blades and Methods of Attaching Them to the Rotors.) E. J. Meier-Tondury. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 15, Mar. 1949, p. 65-75.

Drop forging, precision casting, and machining of the blades, with special emphasis on English and American trends.

19A-152. Tiefziehen dunner Bleche mit Sonderwerkzeugen. (Deep-Drawing of Thin Sheet Metals With Special Tools.) Helmut Beisswanger. *Zeitschrift fur Metallkunde,* v. 40, Mar. 1949, p. 101-115.

With emphasis on the factors (type, thickness, and properties of the metals, punch-and-die design) that determine the success or failure of the operation. 14 ref.

19A-153. Cold Rolling Technique. IV. Simplified Rolling Mill Calculations. (Continued.) Hugh Ford. *Sheet Metal Industries,* v. 26, May 1949, p. 960-962; discussion, p. 963-964; June 1949, p. 1205-1208.

May issue—method of calculation, using the lever arm as a fraction of the deformed arc length, and examples. June issue—Cook and Larke's method based on the lever arm, and its derivation. (To be continued.)

19A-154. Practical Problems of Light Presswork Production. (Continued.) J. A. Grainger. *Sheet Metal Industries,* v. 26, June 1949, p. 1227-1234.

Future trends, and various features of present-day equipment. (To be concluded.)

19A-155. Power Squaring Shears: Operation and Maintenance. *Sheet Metal Worker,* v. 40, June 1949, p. 39-41.

19A-156. It's Easy to Calculate Die Clearances. J. R. Paquin. *American Machinist,* v. 93, June 16, 1949, p. 102-103.

Two simple rules and two tables of constants which enable the designer to make correct allowances on piercing and blanking dies.

19A-157. Die Mechanisierung des Feinblechwalzwerkes. (Mechanization of Thin-Sheet Rolling Mills.) Wilhelm Krämer. *Stahl und Eisen,* v. 69, May 26, 1949, p. 359-371.

Design details of various types used in Germany since the latter part of the 19th century.

19A-158. Production Economies Gained by Using Standard Oil-Hydraulic Presses for a Variety of Tasks. W. C. Denison. *Modern Industrial Press,* v. 11, June 1949, p. 6, 8, 38.

Switch-over from ordinary shop chores to special job setups, by means of tooling and accessories for standardized equipment, to reduce costs.

19A-159. High Speed Presswork Accuracy Basic in Burroughs Production Plan. P. D. Aird. *Modern Industrial Press,* v. 11, June 1949, p. 13-14, 18, 22, 38.

Fabrication of various parts for accounting and calculating machines. Tolerances.

19A-160. Presses Important in the Manufacture of Vibration Control Mountings. Walter Rudolph. *Modern Industrial Press,* v. 11, June 1949, p. 26, 28, 30, 34.

Presses and production procedures for the above and bonded rubber products.

19A-161. Small Presses Help "Keep 'Em Flying" at Spokane Air Force Base, Spokane, Wash. Howard E. Jackson. *Modern Industrial Press,* v. 11, June 1949, p. 40, 42, 46.

Setup for repairing B-29 superforts. Work breaks down to line work, fabrication, and manufacture and repair of parts in shops.

19A-162. Beam and Channel Roll Design. Ross E. Beynon. *Iron and Steel Engineer,* v. 26, June 1949, p. 51-76.

19A-163. Trends in High Speed Rolling. Ralph H. Wright. *Iron and Steel Engineer,* v. 26, June 1949, p. 77-80; discussion, p. 80-82.

Believes that maximum rated rolling-mill speeds have now reached such high limits that developments in the near future will be directed to more effective utilization of available speeds.

19A-164. Metal Spinning Geometry. *Western Machinery and Steel World,* v. 40, June 1949, p. 94-95.

Thickness and diameter vs. speed for Al, Cu, brass, cold rolled steel, and stainless steel; also chart of peripheral metal-spinning speeds, showing geometrically related thickness and diameter for actual case histories.

19A-165. A Simple Type of Draw-Bench: Its Design and Applications. A. Schofield. *Machinery* (London), v. 74, June 9, 1949, p. 774-776.

Use of rolls as well as draw blades for forming of sheet metal.

19A-166. Eight Reasons for Indirect Piloting. J. R. Paquin. *American Machinist,* v. 93, June 30, 1949, p. 80-81.

Two methods of piloting in progressive dies. Direct piloting consists of piloting in holes punched in the part at a previous station. This is the ideal method. However, when ideal conditions do not exist, indirect piloting must be used to achieve the desired results. The latter consists of piercing holes in the scrap strip and locating these holes with pilots at later operations.

19A-167. Continuous Rod Drawing, Straightening, Polishing. Dan Reebel. *Steel,* v. 125, July 11, 1949, p. 100-101, 104.

Equipment performs at high speed on both ferrous and nonferrous stock. Component pieces of equipment comprising a continuous line are interlocked electrically and mechanically and provide automatic operation with a production approximately two and three times that obtained from conventional and continuous drawbenches, respectively.

19A-168. An Analysis of Blanking Die Designs. Part IV. C. W. Hinman. *Modern Machine Shop,* v. 22, July 1949, p. 110-112, 114, 116.

Construction and operation of sectional and inverted compound blanking dies.

19A-169. Strength and Failure Characteristics of Metal Membranes in Circular Bulging. W. F. Brown, Jr., and F. C. Thompson. *Transactions of the American Society of Mechanical Engineers,* v. 71, July 1949, p. 575-585.

Circular hydraulic bulges were formed from a group of materials having widely varying strain-hardening rates. The complete development of the shapes and strain distributions was determined experimentally, and stress and radius of curvature at the pole calculated as a function of maximum strain. Analysis revealed that strain gradients and bulge heights were influenced by stress-strain characteristics. Instability was exhibited by all materials having a sufficient ductility at strains varying from −0.47 for 75S-O to −0.64 for annealed low-carbon steel. Height and maximum strains (forming limits) obtainable in bulging were greatly reduced by the presence of surface flaws or a large grain size. 16 ref.

19A-170. La fabrication et le controle des fils de contact en aluminium-acier. (Fabrication and Inspection of Aluminum-Steel Trolley Wires.) Louis Albert. *Revue de l'Aluminium,* v. 26, May 1949, p. 178-181.

Specifications.

19A-171. Wire Loop-Forming Tool. Böthig. *Engineers' Digest,* v. 10, June 1949, p. 202. Translated from *Werkstatt und Betrieb,* v. 81, Dec. 1948, p. 367.

Described and illustrated.

19A-172. Requirements of Drawing Compounds. James McElgin. *Steel Processing,* v. 35, June 1949, p. 306-309.

New types now available.

19A-173. Precision Forging of Temperature-Resistant Jet-Engine Blades. C. H. Smith, Jr. *Machinery* (American), v. 55, July 1949, p. 160-167.

Techniques employed in forging tough alloys that resist deformation even at high temperatures.

19A-174. Thin Wall Bearings; An Important Production Development by Glacier Metal Co., Ltd. *Automobile Engineer,* v. 39, July 1949, p. 265-267.

Novel method and equipment for production of bimetal shell bearings. The method used consists essentially of rolling the lining strip to the proper form using a continuous automatic three-roll system.

19A-175. New Lock-Making Plant Features Intricate Operations. Hugh G. Jarman. *Canadian Metals and Metallurgical Industries,* v. 12, July 1949, p. 14-15, 33-34.

Plant, working and machining equipment and operations.

19A-176. Designing Extrusion Dies for Complicated Sections. Carl Dovano. *Tool Engineer,* v. 23, July 1949, p. 38-39.

Recommended procedures.

19A-177. Calculations for Producing a Rectangular Lid. L. X. Nepomuceno. *Sheet Metal Industries,* v. 26, July 1949, p. 1452-1454.

Formulas of a general nature for the forming of lids of arbitrary dimensions.

19A-178. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries,* v. 26, July 1949, p. 1481-1487.

Design and use of sectional or built-up punches and with certain specific types of these punches. Maintenance and construction requirements. (To be continued.)

19A-179. Fast Lighting Fixture Production Featured at Columbia Electric & Mfg. Co., Spokane, Wash. Howard E. Jackson. *Modern Industrial Press,* v. 11, July 1949, p. 20, 22, 26, 28, 34.

Fast production in the manufacture of commercial and industrial fluorescent lighting fixtures can be achieved by employing many conventional factory-made presses, and some unconventional shop-made presses.

19A-180. Why Hydraulic Presses? *Modern Industrial Press,* v. 11, July 1949, p. 44, 46, 48, 50-51. Based on article by Herbert Chase in *News Reel* (Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.)

The case for the hydraulic press in comparison with mechanical-type presses in the working of sheet metal.

19A-181. New Developments Aid Western Presswork. Thomas A. Dickinson. *Steel Processing,* v. 35, July 1949, p. 359-361, 387.

At various Western plants.

19A-182. Accurate Blanks Without Dies. John J. Murphy. *Steel,* v. 125, July 25, 1949, p. 65, 93.

Production on rugged squaring shears equipped with a precision gaging system.

19A-183. An Analysis of Blanking Die Designs. Part V. C. W. Hinman. *Modern Machine Shop,* v. 22, Aug. 1949, p. 90-92, 94, 96.

Both conventional and inverted compound blanking and perforating dies.

19A-184. Fundamentals of Compression Bending. Ralph M. Shaw, Jr. *Tool Engineer,* v. 23, Aug. 1949, p. 21-22.

Compression process in which the die is stationary and the roll wipes the piece being bent into the die. Draw, roll, and ram processes.

19A-185. Jets, Turbines Demand New Forging Methods. *SAE Journal,* v. 57, Aug. 1949, p. 67. Based on "Forging of High-Temperature Alloys", by L. S. Fulton.

Recommended procedures. Compositions of eight Fe-base, four Ni-base, and six Co-base high-temperature alloys.

19A-186. Ball-Broaching Gears and Bushings for Aircraft Engines. R. C. Barron. *Machinery,* v. 55, Aug. 1949, p. 147-151.

Method for secure assembly of bushings in the bores of aircraft-engine reduction gears, pinions, and other parts. It provides a means of securing bushings that entirely eliminates the use of pins, keys, splines, and other fastening devices. Essentially, the process consists of pressing through the bore of the part, a tool containing a number of hardened steel balls located tangent to each other and free to revolve in an annular race. Plastic flow of metal, caused by the rolling action of the balls, produces round-bottomed furrows 0.0005-0.0015 in. deep, and metal is raised 0.0003-0.0005 in. above the bore surface at each side of the furrows. No cutting or shearing action occurs, nor is the broached surface weakened in any way. On the contrary, the cold working increases strength and hardness.

19A-187. Straightening of Coil Stock for Press Operations. P. E. McKeith. *Tool & Die Journal,* v. 15, Aug. 1949, p. 49, 52, 54.

Recommended procedures and equipment.

19A-188. Automatic Crimping Boosts Production. *Tool & Die Journal,* v. 15, Aug. 1949, p. 50-51.

Set-up for crimping thin metal tubes to ceramic insulators, a critical operation in producing neon-sign electrodes.

19A-189. What To Watch in Shaving-Die Design. J. R. Paquin. *American Machinist,* v. 93, Aug. 11, 1949, p. 102-104.

Blanked parts must be shaved to produce smooth precise edges for many requirements. Design requirements for the dies.

19A-190. Why Shear Is Applied to Dies. J. R. Paquin. *American Machinist,* v. 93, Aug. 25, 1949, p. 84-85.

Several factors make shear desirable in cutting dies, the principal one being reduction in power required to operate the press. Recommended methods.

19A-191. Fundamentals of the Working of Metals. Part II. Effects of Forming Speed. George Sachs. *Modern Industrial Press,* v. 11, Aug. 1949, p. 6, 8, 46, 48, 50.

Clarified by means of diagrams.

19A-192. The Fundamentals of Metal Forming. Part I. *Modern Industrial Press,* v. 11, July 1949, p. 32, 34.

Low-temperature brittleness; cold working; hot working; overheating; forming resistance and temperature. (To be continued.)

19A-193. Fabrication of Sheet Metal at Solar Aircraft Company. Gerald E. Stedman. *Modern Industrial Press,* v. 11, Aug. 1949, p. 38, 40, 42, 44.

Press operations and equipment. Much of the metal forming is accomplished on dies produced by the "Sol-A-Die" process. High-temperature alloys are the principal materials.

19A-194. The Evolution of Roasting Pans. Joseph Nash. *Sheet Metal Worker,* v. 40, Aug. 1949, p. 45-47.

How modern equipment produces a superior product at a rate of 1000 per day. Principal techniques are forming, welding, and riveting.

19A-195. Determining the Centre of Cut for Blanking and Piercing Tools. Federico Strasser. *Machinery* (London), v. 75, Aug. 4, 1949, p. 158.

Simple technique.

19A-196. Forming Operations on Multi-Slide Machines. *Machinery* (London), v. 75, Aug. 4, 1949, p. 162-163.

19A-197. Cold Rolling Technique. IV. Simplified Rolling Mill Calculations. Hugh Ford. *Sheet Metal Industries,* v. 26, July 1949, p. 1427-1436; Aug. 1949, p. 1651-1656, 1666.

How to use the Cook and Larke method, and application to typical cases. Calculation of roll force by the "energy method". Examples showing how to use the energy-roll-force curve. Calculated and experimental results compared. Energy method applied to results of rolling tests on copper. Results compared for 0.1-in. steel and copper of the same thickness. A generalized curve. (To be continued.)

19A-198. Some Theoretical Aspects of the Determination of Plastic Strains in Sheet Metal. K. L. Jackson. *Sheet Metal Industries,* v. 26, July 1949, p. 1447-1451; Aug. 1949, p. 1715-1720.

Calculation of drawing strains in tinplate 0.010 in. thick and with C16 tin coating. Limited to the case where the corner radius of the shells between the base and the wall is not more than 0.040 in. Analytical investigation of the three principal strains in the wall of a circular solid drawn shell (nonhardening material).

19A-199. Wire Drawing; A New Application for 'VSG' Hydraulic Drives. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1685-1686.

19A-200. Practical Problems of Light Presswork Production. (Concluded.) J. A. Grainger. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1703-1713, 1720.

Press-frame construction; improvements in operating controls; roll-feed mechanisms; clutches; automatic feeding mechanisms; guards; safety in design.

19A-201. Pre-Spun Shapes Facilitate Drop Hammer Forming. Gilbert C. Close. *Finish,* v. 6, Sept. 1949, p. 19-21, 54.

Research and plant experience in short-cutting fabrication procedure by spinning flat metal sheets into neutral shapes.

19A-202. Cam-Operated, Double-Action Roofing Press Raises Output, Lowers Maintenance. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Sept. 1949, p. 96-100.

Use for manufacture of aluminum and steel roofing.

19A-203. Die Innovations Can Speed Operations. Frank Charity. *Machine and Tool Blue Book,* v. 45, Sept. 1949, p. 105-106, 108, 110, 112, 114.

Several interesting developments in die design and manufacture of products by presswork perfected in West Coast establishments.

19A-204. Unusual Use of Forming Machine Solves Heater Production Problem. *Machine and Tool Blue Book,* v. 45, Sept. 1949, p. 197-198.
Solution of a difficult forming problem in production of a heavily perforated, curved sheet.

19A-205. Pre-Loaded Ball Bearing Guide Pin Bushings in Die Set Design. *Tool & Die Journal,* v. 15, Sept. 1949, p. 56, 58, 60.
Advantages.

19A-206. Copper-Base Die Alloys. J. F. Klement. *Steel,* v. 125, Sept. 5, 1949, p. 84-86, 124.
New alloy claimed to afford longer life and freedom from galling, scratching, and die-maintenance downtime. Methods of production (static and centrifugal casting and torch overlay deposition on a steel or cast-iron die body), die finishing, drilling and tapping, and lubrication.

19A-207. An Analysis of Blanking Die Designs. Part VI. *Modern Machine Shop,* v. 22, Sept. 1949, p. 126-128, 130, 132, 134.
Tandem and follow dies designed for perforating and blanking operations.

19A-208. How To Design Small Piercing Punches. J. R. Paquin. *American Machinist,* v. 93, Sept. 8, 1949, p. 93-95.
At least one of the 14 types of punches sketched is believed suitable for almost any piercing operation, whether in low output or high-production dies.

19A-209. Air Presses Punch Instrument Components. John A. Muir. *American Machinist,* v. 93, Sept. 8, 1949, p. 98-99.
Accuracy, production, and operator efficiency were all increased when Sangamo Electric Co. substituted bench-type, air-cylinder presses for kick and hand presses. Staking, piercing, and burnishing operations are handled by standard subpress punch-and-die sets with small-scale tooling.

19A-210. Cold Roll Formed Sections. E. J. Vanderploeg. *Product Engineering,* v. 20, Sept. 1949, p. 134-138.
Use of standard equipment, formability of materials, and design in forming a variety of products from common metals.

19A-211. The Cold-Working of Metals. C. H. Desch. *Engineering,* v. 168, Aug. 5, 1949, p. 137-139; Aug. 12, 1949, p. 161; Aug. 19, 1949, p. 175. A condensation.
A rather extensive discussion of the structural mechanisms involved, including the polishing process.

19A-212. Head, Wrightson Automatic Push Pointing Triple-Draw Tube Drawbench. *Machinery* (London), v. 75, Aug. 11, 1949, p. 194-197.
Construction and operation of machine believed to be the first of its kind.

19A-213. Progressive Piercing, Punching, and Forming Dies. C. R. Cory. *Machinery* (London), v. 75, Aug. 25, 1949, p. 255-259.
Multiple dies for high-production requirements, die designs for producing complex-shaped parts, dies embodying cam action, and coil-feed drawing and blanking dies.

19A-214. The Manufacture of Extruded Electrodes. *Welder,* v. 18 (new ser.), Apr.-June 1949, p. 39-41.

19A-215. Das Simultan-Tiefziehverfahren. (The Simultaneous Deep-Drawing Process.) G. Oehler. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 199-205.
Compares the above, also known as the "telescope" process, with Auble's and conventional processes. Die arrangement for triple-step deep drawing, power consumption, drawing rates, control, and operating procedures. 12 ref.

19A-216. Contour Forming. *Aero Digest,* v. 59, Sept. 1949, p. 64, 102, 104.
Roto Contour Formers, developed by Cyril Bath Co. Typical applications.

19A-217. The Use of Inclinable Punch Presses. (Continued.) J. I. Karash. *Tool & Die Journal,* v. 15, Sept. 1949, p. 52-55.
Design of stripper plate suspensions, die design for inclinable presses, an elevated stationary stripper-plate die, and a piercing die. (To be continued.)

19A-218. Short-Run Piercing of Holes by Fast, Economical Methods. George H. DeGroat. *Machinery* (American), v. 56, Sept. 1949, p. 145-150.
Unusual devices employed to punch holes of various sizes and shapes for mounting condensers, relays, transformers, and other apparatus in panels for electrical equipment.

19A-219. Cold-Swaging Hexagonal Nuts in a Punch Press. F. W. Henke. *Machinery* (American), v. 56, Sept. 1949, p. 168-169.

19A-220. Press-Forging Thin Sections: Effect of Friction, Area, and Thickness on Pressures Required. William Schroeder and D. A. Webster. *Journal of Applied Mechanics,* v. 16 (*Transactions of the American Society of Mechanical Engineers,* v. 71), Sept. 1949, p. 289-294.
Mathematical analysis and results of experimental determination of nondimensional ratios for various conditions of forging.

19A-221. Theorie der bildsamen Formgebung. (Theory of Plastic Forming.) E. Siebel. *Archiv für Metallkunde,* v. 2, no. 7, 1948, p. 248-252.

Reviews the literature. Principles of plastic deformation, mechanical technology of shaping processes and approximation methods for investigating the phenomena that accompany the forming process. Methods of computing slip, internal stresses, and plastic flow resistance. 37 ref.

19A-222. Über Metalldrukerei und die Herstellung von Teilfuttern. (Production of Chucks for Metal Spinning.) Richard Erdmann. *Metalloberflache,* v. 1, sec. B, Aug. 1949, p. B72-B75.

Various shapes of these chucks; details of design and production.

19A-223. Fundamentals of the Working of Metals. George Sachs. *Modern Industrial Press,* v. 11, Sept. 1949, p. 6, 8, 44.

19A-224. Labyrinth Seals. *Aircraft Production,* v. 11, Sept. 1949, p. 289-290.

Used in the gas-turbine engine of the British Armstrong Siddeley Mamba for pressure sealing between rotating and fixed members. Forming equipment and procedure for manufacture of the "fins" used in these seals.

19A-225. Speed Table Guides Metal Spinners. Charles F. Benvie. *American Machinist,* v. 93, Sept. 22, 1949, p. 100-101.

Recommended spinning speeds for various thicknesses of Al, Cu, brass, cold rolled, and stainless steel.

19A-226. 58 Pointers for Design of Successful Progressive Dies. J. R. Paquin. *American Machinist,* v. 93, Sept. 22, 1949, p. 115-117.

19A-227. Wire Die Lubrication. *Wire Industry,* v. 16, Aug. 1949, p. 639.

Types of wet and dry drawing lubricants and aluminum wire lubrication.

19A-228. Sheet Metal Forming Method. *Steel,* v. 125, Sept. 26, 1949, p. 100.

New process known as Marform developed at Glenn L. Martin Co. Advantages include as high as 50% savings.

19A-229. Cold Rolling Technique. V. Resistance of Materials to Deformation. (Continued.) Hugh Ford. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1889-1893; Oct. 1949, p. 2109-2114.

Sept.: Fundamental problems in connection with the resistance offered by cold metal to deformation by rolling. Oct.: Details of measuring yield stress, and curves for typical metals and alloys. (To be continued.)

19A-230. Rolls and Rolling. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Sept. 1949, p. 1069-1077, 1086.

The formation of head, web, and flange into rounds. Design diagrams. (To be continued.)

19A-231. The Evolution of Deep Drawing Lubricants for the Porcelain Enameling Industry. G. A. Cairns. *Better Enameling,* v. 20, Sept. 1949, p. 6-7, 26-27.

A general discussion.

19A-232. Progressive Stamping Dies. John F. Tyrrell. *Metal Progress,* v. 56, Oct. 1949, p. 494-496.

Inexpensive, and nonmathematical method of preparing stage dies for the fabrication of the complex shapes found in aircraft components of sheet metal.

19A-233. Economies of Short-Run Stamping Practice. O. T. Andersen and J. M. Andersen. *Iron Age,* v. 164, Oct. 6, 1949, p. 91-94.

Cost savings obtainable in producing limited quantities of stamped parts by the above method. Factors to be considered in application of this technique and comparative cost data.

19A-234. Pre-Spun Metal Shapes Aid Drop Hammer Forming. Gilbert C. Close. *Modern Machine Shop,* v. 22, Oct. 1949, p. 110-112, 114, 116, 118, 120.

Method for spinning flat metal sheets into neutral shapes.

19A-235. Stresses and Strains in Tube-Drawing. H. W. Swift. *Philosophical Magazine,* ser. 7, v. 40, Sept. 1949, p. 883-902.

An attempt is made to examine in some detail the problem of "empty sinking"—drawing without a restrictive mandrel—in order to test the validity of certain simplifying assumptions, to ascertain the probable effects of various impressed conditions, and to compare the results with available experimental data.

19A-236. Establishing Punch Press Die Standards. E. Griffiths. *Tool Engineer,* v. 23, Oct. 1949, p. 19.

Westinghouse project which involves coordination of die design and construction interests throughout more than 20 divisions in widely separated parts of the country.

19A-237. Pre-Finishing Surface Requirements for Formed Metal Products. Edward Engel. *Tool Engineer,* v. 23, Oct. 1949, p. 25-28.

With respect to surface conditions, tool-design defects and operational precautions, lubrication, annealing, normalizing, and pickling. Recommendations.

19A-238. Back Pull Wire Drawing.

Dartrey Lewis and Howard J. Godfrey. *Wire and Wire Products,* v. 24, Oct. 1949, p. 873-877, 880-885, 982-983.

A continuous wire-drawing machine with controllable back pull and its performance.

19A-239. Deep-Drawing and Waffle-Forming of Airplane Parts. J. J. Sloan. *Machinery,* v. 56, Oct. 1949, p. 152-158.

Processes employed, equipment required, and factors to be considered in designing parts for deep-drawing and waffle-forming.

19A-240. New Metal-Forming Process Developed. *Aviation Week,* v. 51, Oct. 17, 1949, p. 37.

New process, called Marform, which reduces greatly the cost of producing formed sheet-metal parts. Principal feature is precision control of the pressure curve for the forming cycle. This permits pieces to be formed free of wrinkles and reduces spring-back to a minimum. It enables an operator to make complex parts, involving drawing, shrinking and stretching, at the rate of 50-120 per hr., yet hold tolerances to $\pm$0.002 in.

19A-241. Rotary Gang Slitting: An Effective Production Tool. Part III. Eugene L. Mackey. *Steel,* v. 125, Oct. 17, 1949, p. 77-80, 84.

Importance of distinguishing between tonnage production requirements of a given plant and capacities of slitting equipment, how to avoid excessive wear and obtain best results in slitting, and what design features are desirable in slitting-line units.

19A-242. Positive Knockouts for Dies. J. R. Paquin. *American Machinist,* v. 93, Oct. 20, 1949, p. 80-83.

Various designs for positive part ejection under various circumstances.

19A-243. Verfahren zur Ermittlung der Eignung von Ziehfetten. (Process of Determining the Suitability of Drawing Oils.) F. Eisenkolb. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 287-288.

Experiments made to determine the effectiveness of three different oils and oily mixtures as lubricants for the deep-drawing of sheet metals.

19A-244. Die Gestaltung der Pressmatrizen von Metallstrangpressen. (The Shaping of Dies for Metal Extrusion Presses.) F. Hemmerich and N. Arenz. *Metall,* v. 3, Feb. 1949, p. 37-40.

In extrusion of nonsymmetrical bars and rods, flow rate of the metal decreases from the center of the die towards its periphery. Hence, the bars are imperfect in shape and non-uniform in density. A method of correcting this difficulty.

19A-245. Photo-Grid Method Aids Sheet Forming Studies. *Iron Age,* v. 164, Oct. 27, 1949, p. 76. Based on *National Advisory Committee for Aeronautics,* Technical Notes 1010, 1385, 1512, and 1513.

Technique developed by National Bureau of Standards.

19A-246. Fundamentals of the Working of Metals. Part IV. Relations Between Chemical Composition, Grain Structure, Hot Working, and Annealing. George Sachs. *Modern Industrial Press,* v. 11, Oct. 1949, p. 6, 8, 24.

19A-247. Giant Press Concentrates Production of Decorative Panels and Name Plates at Etched Products Corporation. Floyd McKnight. *Modern Industrial Press,* v. 11, Oct. 1949, p. 13-14, 24.

19A-248. The "Hydrodynamic Process". E. Weller. *Modern Industrial Press,* v. 11, Oct. 1949, p. 42, 44, 46.

Process for forming shallow sweeps and shapes and for drawing cone-shaped and tapered stampings in one operation, by use of a fluid punch. Typical products.

19A-249. Advanced Power Press Brake Technique Developed at Temco. *Modern Industrial Press,* v. 11, Oct. 1949, p. 56.

A saving of 5-6 min. per section on end-flanged ducting has been achieved at Texas Engineering and Manufacturing Co., Dallas.

19A-250. Tungsten Carbide Tooling for Cold Heading. Part II. (Concluded.) W. E. Montgomery, W. Leigh, and W. H. Phillips. *Steel Processing,* v. 35, Oct. 1949, p. 531-536, 563.

Design of dies applied to various typical product forms. Factors to be considered when deciding whether or not to use carbide dies. Production data on carbide dies used to produce difficult and easy-to-head products.

19A-251. Reactive Wire Drawing With Hydraulically-Operated Variable Speed Transmission. *Wire Industry,* v. 16, Sept. 1949, p. 727-729.

New British equipment.

19A-252. Diagrammatic Calculation of Die Sizes; Multiple Machine Sets. E. L. Baay. *Wire Industry,* v. 16, Sept. 1949, p. 735, 737-738.

Diagrams for multiple wiredrawing; examples of their use.

19A-253. Flame Spinning; A Method of Forming Steel and Other Metals. K. Harper. *Iron and Steel,* v. 22, Oct. 1949, p. 448-450.

Process and applications. The work is formed by a suitable tool while being rotated, as in conventional spinning, but is simultaneously heated by gas flames.

19A-254. Wire-Drawing Machines; Application of "VSG" Hydraulic Variable-

Speed Drives. *Iron and Steel,* v. 22, Oct. 1949, p. 461-462, 468.

19A-255. The "Pathfinder" Back-Pull Wire-Drawing Machine. *Engineering,* v. 168, Sept. 30, 1949, p. 333-336.

19A-256. Designing Tools for Cold Roll-Forming. Richard T. Angel. *Iron Age,* v. 164, Nov. 3, 1949, p. 83-88.

Design of rolls, guides, punches, coilers, shears, and other tools used for equipment for cold roll-forming metal sections. Formulas for specific design features, as well as factors affecting performance of such tools.

19A-257. An Analysis of Shaving and Burnishing Dies. C. W. Hinman. *Modern Machine Shop,* v. 22, Nov. 1949, p. 174-176, 178, 180, 182, 184.

Several commonly used die designs for handling work economically in shaving dies.

19A-258. A Contributor Discusses Cold Extrusion of Steels, and Its Possible Effect on Wire Production. *Wire Industry,* v. 16, Oct. 1949, p. 805.

Potentialities of new process recently developed in the U. S.

19A-259. Profile Testing for Wire Drawing Dies. *Wire Industry,* v. 16, Oct. 1949, p. 810. From article by H. Mucke, *Stahl und Eisen,* v. 68, Dec. 2, 1948, p. 484.

19A-260. Pre-Spun Shapes Aid Drop Hammer Forming. Gilbert C. Close. *Light Metal Age,* **v. 7, Oct. 1949, p. 6-7, 29.**

It was theorized that prespinning of metal parts into neutral shapes prior to drop-hammer forming would eliminate the necessity of using the first several sets of staging dies, and that the partial control of metal thickness possible during this prespinning process could be used to offset excessive thinning caused by localized metal draw. Investigations led to verification of these advantages. Some parts could be formed in this way that were impossible to form by use of drop-hammer forging alone. Metals used are mainly Al alloys, but the process has also been successfully applied to brass, a Mg alloy, terneplate, and stainless steel.

19A-261. Precision Forging of Gas Turbine Blades. C. H. Smith. *Machinery* (London), v. 75, Oct. 13, 1949, p. 511-516.

As done at Steel Improvement & Forge Co. Includes inspection procedures.

19A-262. Laboratory Determination of Efficiency of Impact During Press Forming. (In Russian.) P. G. Kirillov. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, July 1949, p. 828-830.

An indirect method for the above. The incorrectness of recommending practically constant values of efficiency for impact forming under different deformation conditions. A photographic method of determining deformation.

19A-263. Select Spring Strippers According to Die Requirements. J. R. Paquin. *American Machinist,* v. 93, Nov. 17, 1949, p. 92-94.

Spring stripper plates are made in several ways, depending on the class of die, its size, and possibility of jams arising while in service. The various design arrangements.

19A-264. How Modern Mechanical Presses Operate. Sergius D. Brootzkoos. *American Machinist,* v. 93, Nov. 17, 1949, p. 101-116.

Analysis of mechanical presses, and the kinds of work they handle.

19A-265. Sources of Mechanical Power Presses. Sergius D. Brootzkoos. *American Machinist,* v. 93, Nov. 17, 1949, p. 137.

Companies supplying various types are shown in tabular form.

19A-266. Rolls and Rolling. Part IX. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Oct. 1949, p. 1213-1222, 1231-1232, 1253.

Roll-pass sequences for production of square and related shape bars. (To be continued.)

19A-267. (Book) **Cold Working of Metals.** 364 pages. 1949. American Society for Metals, Cleveland, Ohio.

Papers given at a seminar held during the 30th National Metal Congress and Exposition, Philadelphia, Oct. 23-29, 1948. Individual papers are abstracted separately.

19A-268. Cold-Rolled Sections; Some Aspects of Their Production and Their Applications in Industry. G. Warwick. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2341-2347.

19A-269. Die Lubrication During Metal-working Operations; Applications in the Forging and Stamping Industry. W. E. J. Cross. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 141-145.

Requirements of die lubricants and advantages of use of colloidal graphite.

19A-270. A Review of Techniques in Drop Forging. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 153-156.

19A-271. Rolls and Rolling. Part X. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1341-1346, 1348-1349, 1353.

Roll-pass design principles for production of hexagons from billets.

19A-272. Rolled Bars. Part III. Application of Spread Calculation to Diamond Passes. A. E. Lendl. *Iron and Steel,* v. 22, Nov. 1949, p. 499-501.

19A-273. A Rapid, Simple Method of Determining Shape of Wire Dies. Eugene M. Smith. *Wire and Wire Products,* v. 24, Nov. 1949, p. 1025-1026.

Method that appears to have all the advantages of those previously described, and none of their deficiencies. Facsimile impressions are obtained by use of a hard, dental, inlay-casting wax. The profile of the wax impression is examined visually or microscopically.

19A-274. Some Uses and Applications of Die Cushion Equipment in Presswork Production. W. Egginton. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2379-2384.

Design of equipment of various types. Limits on selection of the proper type.

19A-275. The Compression Test in Relation to Cold Rolling. N. H. Polakowski. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 250-276.

Part I: Significance of the static compression test is discussed, and wide discrepancies in existing comparative data. A multi-stage test method in which the specimens are repeatedly machined after approximately 25% compression is developed. By this method 90% reduction or more may be obtained under almost uni-axial conditions. Yield-stress curves of commercial Al, Cu, Armco ingot iron, five carbon steels and two low-alloy steels, both in the as-rolled and annealed conditions, were established. Part II: The compression test is analyzed in regard to initial critical shape of the specimens and subsequent elastic deformation of the compressing tools at high stresses. Deductions are applied to cold rolling. Some peculiar relations between external friction, roll force, torque, work of deformation, and speed effects are explained. 47 ref.

19A-276. An Investigation of Back-Pull Wire Drawing as an Industrial Technique. J. G. Wistreich. *Journal of the Iron and Steel Institute,* v. 163, Nov. 1949, p. 316-330.

A more complete version of article abstracted from *Wire Industry.* See item 19B-168, 1949.

19A-277. Production of Sheet Metal Components for Jet-Propulsion Units. *Machinery* (London), v. 75, Nov. 10, 1949, p. 667-672.

Procedures and equipment. The parts are stamped, deep drawn, rolled and welded. High-Ni alloys, stainless steel, and low-carbon steel are used.

19A-278. A Simple Forming Tool. F. Strasser. *Machinery* (London), v. 75, Nov. 10, 1949, p. 680.

Tool for final forming of components when the quantities required do not justify more elaborate and expensive arrangements.

19A-279. Stretch Formed Sheet Metal Parts. W. T. Kluge. *Western Machinery and Steel World,* v. 40, Nov. 1949, p. 90-93.

See abstract from *Light Metal Age,* item 19D-52, 1949.

19A-280. Cold Working Simplified by Lead-Lubrication Process. *Steel,* v. 125, Dec. 5, 1949, p. 114.

New method which can be used with low-carbon alloy and stainless steels and other metals. Typical applications are deep drawn parts of many kinds, steel cartridge cases, wire, tubing, etc. The material is simply coated with pure lead. The lubricating effect is reported to be remarkable.

19A-281. Draw Forming With Inexpensive Dies. J. J. Sloan. *Automotive Industries,* v. 101, Dec. 1, 1949, p. 40-43, 76.

Examples of deep drawing and waffle forming, particularly as applied to aircraft manufacture. Drop-hammer techniques as applied to waffle forming.

19A-282. Product Possibilities for the Cold Heading Process. *Product Engineering,* v. 20, Dec. 1949, p. 108-111.

Parts suitable for forming by cold heading; limitations on size, shape, and amount of upset; materials that can be used; tolerances that can be held; and other design data.

19A-283. New Forming Process Developed. *Steel Processing,* v. 35, Nov. 1949, p. 601, 617.

"Marform" process developed by Glenn L. Martin Co., and its applications. Principal feature is precision control of the pressure curve for the forming cycle. This control enables parts to be formed free of wrinkles and reduces springback to a minimum.

19A-284. Piercing and Notching Structural Angles. Ralph Weisbeck. *Tool & Die Journal,* v. 15, Dec. 1949, p. 66, 68, 72.

Simplified, independent, self-contained, hole-punching units.

19A-285. Specials Are Made to Do Tough Jobs. W. H. Hill. *Fasteners,* v. 6, no. 2, 1949, p. 2-5.

Various threaded fasteners of spe-

cial design made by cold forging and heading of ferrous and nonferrous metals.

19A-286. Multi-hole Piercing of Parts in Small Quantities. *Machinery* (London), v. 75, Nov. 24, 1949, p. 739-743.

Several unusual methods and apparatus used in the piercing of holes of various sizes and shapes.

19A-287. Compression Test; Significance in Relation to Cold Rolling. N. H. Polakowski. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 588-596; discussion, p. 605-607.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 19A-275, 1949.

19A-288. Wiredrawing. I. S. Morton. *Machinery Lloyd* (Overseas Edition), v. 21, Nov. 19, 1949, p. 68-78.

Historical development and underlying principles. Equipment and methods in use today.

19A-289. A New Approach to Investigation of the Effectiveness of Lubricants for the Working of Metals by Compression. (In Russian.) S. Ya. Veiler and L. A. Shreiner. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 68, Sept. 11, 1949, p. 325-328.

See abstract from *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), item 19A-149, 1949.

19A-290. Cold Rolling Technique; The Application of Theory and Experiment to the Practice of Rolling. 5. Resistance of Materials to Deformation. (Continued.) Hugh Ford. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2333-2340.

Use of compression and hardness tests for determination of the yield-stress curve. Effect of lubricant. Results for rolled copper strip. Compares results by the plane-compression test with other test results, and compares the yield-stress curve for cold rolling with homogeneous compression. (To be continued.)

19A-291. A Practical Workshop System for the Care and Maintenance of Press Tools. (Continued.) W. M. Halliday. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2385-2390.

Functions and action of stripping mechanisms, strippers for blanking-press tools, lubrication, and maintenance requirements. (To be continued.)

19A-292. The Use of Inclinable Punch Presses. (Continued.) J. I. Karash. *Tool & Die Journal,* v. 15, Nov. 1949, p. 60, 62, 64, 66, 68; Dec. 1949, p. 56, 58, 60, 62.

Nov. issue: Piercing die with jigger pin arrangement, inverted piercing die, compound die, and inverted compound die. Dec issue: Examples of a pilot-type piercing die, of a compound pilot die, of progressive dies (end and center cut-off), and of bending dies. (To be continued.)

19A-293. Manufacturing Intake Manifolds at Solar Aircraft Company. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Dec. 1949, p. 83-84, 86, 88, 90, 92, 94, 96.

Blanking, forming, soldering, welding, and other operations.

19A-294. Mold Dies. 1. Mold Die Hobbing. Islyn Thomas and Edmund W. Spitzig. **2. Mold Finishing.** M. C. Overholt. *Tool Engineer,* v. 23, Dec. 1949, p. 26-28.

Design and procedures for a specialized phase of mold making sometimes known as "hubbing".

19A-295. A Machine That Helps to Make Its Own Dies. Cyril J. Bath. *Machinery* (American), v. 56, Dec. 1949, p. 173-174.

Curved steel shapes for a large variety of applications can be produced on the contour former. An unusual feature is that it can be used to produce the forming element of its own dies, which makes possible a substantial reduction in original cost of the dies.

19A-296. Spinning of Difficult Shapes Simplified by Use of Speed Chart. Herbert E. Edlund. *Materials & Methods,* v. 30, Dec. 1949, p. 47-49.

Use of direct-reading charts for metal-spinning speeds. These show relations of speeds to diameter and gage of blank for ductile material and for stainless and special materials.

19A-297. Better Press Performance Expected in Asymmetrical Deep Drawing Operations. W. T. Lankford, S. C. Snyder, and J. A. Bauscher. *Steel,* v. 125, Dec. 19, 1949, p. 82-84, 86.

See abstract from *American Society for Metals,* Preprint No. 30, 1949, item 19B-207, 1949.

19A-298. Das Fliesspressen von Hülsen in Rechnung und Versuch. (The Deep Drawing of Shells in Theory and Experiment.) Martin Dipper. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 275-286.

Theoretical principles and the theoretically computed energy consumption with the energy actually consumed, the comparison indicating the efficiency of specific deep-drawing processes. 17 ref.

19A-299. Walzen-Anwärm-und-Kühlvorrichtungen an Feinblechgerüsten. (Heating and Cooling Devices on Light-

Gage Sheet-Metal Rolling Mills.) Wilhelm Krämer. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 711-712.

19B—Ferrous

19B-1. Gas Applied to Modern Steel Forging. Charles C. Eeles. *Industrial Gas,* v. 27, Dec. 1948, p. 11-13, 25-27.

Equipment and procedures.

19B-2. Western Cold Rolled Steel. Ralph G. Paul. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 74-77, 96-97, 110.

New cold-reduction mill of Columbia Steel Co., Pittsburg, Calif.

19B-3. The Manufacture of Wrought Steel Wheels. W. A. Ashton and R. N. Merk. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 37-47; discussion, p. 48.

Developments and practices in the manufacture of wrought steel wheels and forged circular sections for transportation equipment.

19B-4. Carnegie-Illinois Modernizes Sheet Facilities at the Irvin Works. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 102-105.

19B-5. Pre-Forming in Forging Operations. *Machinery* (London), v. 73, Dec. 9, 1948, p. 805-806.

New forging technique known as "Maxirolling," developed in the U. S. Reduced scrap loss, increased die life, and higher production rates are advantages claimed.

19B-6. Fabricating Motor Truck Bodies. *Sheet Metal Worker,* v. 39, Dec. 1948, p. 33-34, 37.

Sheet-metal press and shear operations; welding operations.

19B-7. Air Cylinders and Group Punching Save Time. *Sheet Metal Worker,* v. 39, Dec. 1948, p. 48.

Use of above in punching numerous openings of several sizes, shapes, and spacings, in 18 gage, cold-rolled steel fluorescent lighting-fixture blanks.

19B-8. Unusual Fabrication Procedures Employed at Servel, Inc. Gerald E. Stedman. *Modern Industrial Press,* v. 10, Dec. 1948, p. 20, 24, 26.

Press operations in manufacture of gas refrigerators.

19B-9. Use of Presses in Fabrication of Radio Loudspeakers. Walter Rudolph. *Modern Industrial Press,* v. 10, Dec. 1948, p. 30, 32, 34, 42.

Procedures at Rola Co., Cleveland.

19B-10. Hot Drawing Steel Wire; Some Points of Interest. *Wire Industry,* v. 15, Dec. 1948, p. 817.

19B-11. Forging Die Design. The Bender. Part II. John Mueller. *Steel Processing,* v. 34, Dec. 1948, p. 641-643, 648.

The forging of parts which cannot be obtained directly from one set of hammer dies.

19B-12. Hot Drawing of HSS Drill Rod. L. V. Klaybor. *Tool & Die Journal,* v. 14, Jan. 1949, p. 46-49.

Process developed by Allegheny Ludlum Steel Corp. Curves show effects of repeated annealing on hardenability of cold-drawn 18-4-1 high speed steel rod, the higher hardness attained by hot drawn rod, and torque-twist curves for hot and cold drawn rods.

19B-13. Cold Finished Bars. H. M. Smith. *American Iron and Steel Institute,* 1948, 7 pages.

History, the dies required, production of quality surfaces, production of improved machinability, and production of irregular sections.

19B-14. Steel Wire. Francis Eickleman. *American Iron and Steel Institute,* 1948, 7 pages.

History, manufacture, terminology, classification, and heat treatments.

19B-15. Merchant Wire Products. H. A. Caldwell and C. L. McGowan. *American Iron and Steel Institute,* 1948, 8 pages.

History of the manufacture of steel and iron wire. A few of the wire products which are important from a tonnage standpoint.

19B-16. Flat Rolled Steel on the Pacific Coast. O. L. Pringle. *American Iron and Steel Institute,* 1948, 11 pages.

Various installations, their capacities and outputs.

19B-17. Producing Western Steel. Part II. Steel Rolling. *Victor Weld,* Dec. 1948, p. 4-6.

How steel is made in the West. Equipment and procedures at Bethlehem-Pacific's South San Francisco and Seattle plants. (To be continued.)

19B-18. Hot Drawing High Speed Drill Rod. L. V. Klaybor. *Steel Horizons,* v. 11, no. 1, [1949], p. 16-18.

See abstract from *Tool & Die Journal,* item 19B-12.

19B-19. Re-Engineered Tooling Simplifies Tube Bending Problems. Gerald E. Stedman. *Production Engineering & Management,* v. 23, Jan. 1949, p. 49-52.

How automatic special purpose machines are boosting output of bent steel tubing for refrigerators.

19B-20. Electrical Developments in the Steel Industry—1948. H. W. Poole. *Blast Furnace and Steel Plant,* v. 37, Jan. 1949, p. 77-80.

The magnetic amplifier; blooming and slabbing mills; hot strip mills;

tandem cold strip mills; temper-pass mills; induction heating; and miscellaneous other developments.

19B-21. Twin Coach Plant in Buffalo Makes Rapid Strides. Walter Rudolph. *Modern Industrial Press,* v. 11, Jan. 1949, p. 28, 32, 34, 36.

Manufacture of bus bodies, press operations, welding, riveting, and assembly.

19B-22. Electric Motors Over Three Hundred Horsepower Applied to Main Roll Drives in the Iron and Steel and Allied Industries During 1948. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 118-119.

A tabulation.

19B-23. New Hot Strip Mill in Operation at Superior Steel Corp. *Iron and Steel Engineer,* v. 26, Jan. 1949, p. 134-135.

19B-24. Low-Alloy High-Tensile Steels for Automotive Structures. C. L. Altenburger. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 145-155.

Previously abstracted from condensed version in *SAE Journal.* (See item 19b-94, 1948.)

19B-25. Modern Manufacturing Methods for the Production of Steel Sheets. H. H. Stanley. *Sheet Metal Industries,* v. 25, Aug. 1948, p. 1537-1544, 1558.

Various methods and equipment and their respective merits.

19B-26. Metal Container Manufacture; A Review of Some Modern Production Methods. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 1981-1988; Nov. 1948, p. 2206-2207.

Printing; slitting or guillotining; rolling, body forming or pressing; flanging; side seaming or end seaming; soldering or doping; wet testing; assembling and packing.

19D-27. Impact Extrusion; Some Preliminary Results of a Recent Research. Richard Hanes. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 89-97, 102.

Applications and advantages. The work described was done with aluminum.

19B-28. The Application of Phosphate Coatings to Wire, Tube and Deep Drawing. H. A. Holden and S. J. Scouse. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 123-134, 136.

Properties of the coating, and applications for protection and as a lubricant for miscellaneous steel working processes. 14 ref.

19B-29. Upset Forgings. H. A. Whiteley. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 195-202.

Equipment, procedures, and applications.

19B-30. Bending Heavy Bars and Structural Shapes on Hydraulic Bulldozers. Charles H. Wick. *Machinery (American),* v. 55, Feb. 1949, p. 172-176.

Hydraulically operated bulldozers of 50 and 100 tons capacity are used to bend tubes, channels, bars, and other shapes as thick as 1 in.

19B-31. How Forging Acts to Enhance Metal Properties. E. O. Dixon and E. J. Foley. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 147-152.

Effect of the hot working method upon the physical properties of steel. Effect of hammer-forging for reductions of 0 to 96%, when open dies are used. In closed-die studies, billet material reduced 80 and 92% by rolling was used.

19B-32. Fabrication of Washing Machine Wringer Parts. Walter Rudolph. *Modern Industrial Press,* v. 11, Feb. 1949, p. 38, 40, 42, 44.

Press and finishing equipment and procedures.

19B-33. The Seamless Story. J. Perc Boore. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 78-81.

Mannesmann piercing process for production of seamless tubing. Other processes. The classification of seamless steel tubing.

19B-34. Internal Forging Conveyor Chain. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 92-93.

New type of conveyer chain incorporates ball-and-socket action for free movement. Mass production of the sockets by internal forging is done by a new method, the patent for which is pending.

19B-35. Forming and Welding Operations: Key Factors in Tank Fabrication. E. F. Ross. *Steel,* v. 124, Feb. 28, 1949, p. 76-79, 94, 99.

Production of both domestic and industrial hot water tanks. High handling efficiency is combined with latest methods of forming, welding, testing, and galvanizing.

19B-36. Crucible Completes $3,200,000 Plant Improvement Program. *Steel,* v. 124, Feb. 28, 1949, p. 90, 93.

Cold-rolling and special-products divisions of the enlarged and newly-designated Spaulding Works of Crucible Steel Co. of America are now in production on a wide range of alloy, stainless, and high-carbon-steel specialties. Cold-rolling, annealing, and pickling facilities.

19B-37. Keystone Steel & Wire Modernizes Rod Mill. *Iron Age,* v. 163, Mar. 3, 1949, p. 109-110.

19B-38. Progressive Die Design, Part XIII. C. W. Hinman. *Modern Machine Shop,* v. 21, Mar. 1949, p. 134-136, 138, 140.

How transfer-slide mechanism incorporated in the design of a progressive die helps to increase production of tobacco-can covers.

19B-39. A Modern Heavy Forging Plant. W. H. Alvey. *Journal of the Iron and Steel Institute,* v. 161, Feb. 1949, p. 119-138.

Extensive details concerning equipment and layout.

19B-40. The Volume Production of Silverware. Arthur Q. Smith. *Industrial Gas,* v. 27, Feb. 1949, p. 5-7, 29-30.

Equipment and procedures used in manufacture of the stainless steel blanks on which silver is plated. Forging, rolling, heat treating.

19B-41. Republic Steel's Gadsden Pipe Mill Now Operating at Full Capacity. Charles Longenecker *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 220-222.

Forming and welding equipment and procedures.

19B-42. Rolls and Rolling. Part II. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 206-211.

Fundamental principles of design of blooming-mill rolls. Simple diagrams showing a variety of types. (To be continued.)

19B-43. Die Sinking for Drop Forging. Part I. Die Block Selection. John Mueller. *Steel Processing,* v. 35, Feb. 1949, p. 75-78.

Manufacture and selection of die blocks as required for the different types of forgings and forging materials. (To be continued.)

19B-44. Gary Sheet and Tin Mill Modernization Completed. *Iron Age,* v. 163, Mar. 17, 1949, p. 91-93.

Rolling, shearing, trimming, annealing, cleaning and finishing facilities.

19B-45. Stresses Induced by the Shot-Peening of Leaf Springs. J. C. W. Humfrey. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 189-193; discussion, p. 398-431.

A series of fatigue tests on vehicle leaf springs after shot-peening under various conditions; measurements of the surface compressive stresses induced by the peening. How stress values can be obtained from changes of camber. Results showing variation in compressive stress with depth.

19B-46. The Production of Favourable Internal Stresses in Helical Compression Springs by Pre-Stressing. D. G. Sopwith. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 195-207; discussion, p. 398-431.

The load-carrying capacity of a helical compression spring can be increased considerably by pre-stressing or "scragging", i.e., compressing the spring to closure several times. This results in the introduction of favorable internal or residual shear stresses. The principles underlying the process and the distribution of the residual stresses and of the stresses under load. Application of these principles to various design problems.

19B-47. Autofrettage. A. G. Warren. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 209-218; discussion, p. 398-431.

The load which a nonuniformly stressed structure will withstand may be considerably increased by suitable initial stresses induced by mutual action between the separate members or parts of the structure. An example of such initial stressing is the "built-up" gun. Certain discrepancies between theory and practice are due to the inadequacy of the maximum shear-stress theory of failure. A much closer agreement between theory and practice is found on the basis of the Mises-Hencky criterion of elastic failure.

19B-48. Prestretching Increases Strength of Steel T-Beams in University of Iowa Tests. Ned L. Ashton. *Civil Engineering,* v. 19, Mar. 1949, p. 42-43.

19B-49. Chemische Uberzuge zur Verbesserung der Kaltverformung von Stahl. (Chemical Coatings for Improvement of the Cold Working of Steel.) Wilhelm Overath. *Stahl und Eisen,* v. 68, June 17, 1948, p. 231-235.

Chemical coatings, especially phosphate coatings, and their effect on cold working. Explains the physico-chemical behavior and the lubricating effect of such coatings on the various types of cold working operations. Chemical and physical properties of phosphate films. 14 ref.

19B-50. Crucible Steel Company of America Completes Improvements at Spaulding Works. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 343-344.

New equipment for cold rolling and inspection.

19B-51. Shoes for the Iron Horse. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 90-92.

Rolling and press operations in production of railroad tie plates.

19B-52. Republic Steel Products Flow From Western Plant. *Western Metals,* v. 7, Mar. 1949, p. 19-21.

Procedures and equipment for producing cold-drawn steel in a wide variety of smaller sizes and shapes. Principal equipment includes draw-benches; wire blocks; equipment for straightening and cutting bars and straightening wire; turning machines; grinders for wire sizes; and centerless grinders.

19B-53. Residual Stresses in Rolled Sheet. Ya. S. Gallai, M. I. Zlotnikov, and N. N. Sokolovski. *Engineers' Digest,* v. 10, Feb. 1949, p. 41-42. Translated and condensed from *Stal* (Steel), No. 1, 1948, p. 37-45.

Test results for five low-alloy steels (compositions given) shown graphically and discussed.

19B-54. A Review of the Application and Design of Heavy Forging Presses. J. A. Sanderson and J. G. Frith. *Journal of the Iron and Steel Institute,* v. 161, Mar. 1949, p. 231-246.

Present-day forging practice; tendency toward larger ingot sizes, and the probable press powers required to deal with these ingots. Details of the size and location of existing heavy presses, together with lists of ingot capacities of the various sizes both for forging and upsetting. British and American practice compared. Various methods of press construction.

19B-55. Technical Developments in the Manufacture of Full Finish Steel Sheets. W. H. R. Bird. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 513-524.

Development of the modern full finish or auto-body steel sheet—improvement in sheet surface, and improvement in drawability. The aspect of surface in relation to steelmaking technique and to rolling and processing into sheets. Effect of chemical analysis, practical limits of purity in steelmaking, and effect of segregation in rimming steels on drawability. The problem of strain-age hardening in rimming steels; recent developments in non-aging steels.

19B-56. Five Presses Linked Automatically Speed Output of Ford Axle Housings. P. D. Aird. *Modern Industrial Press,* v. 11, Mar. 1949, p.13-14, 17-18, 40.

Described and illustrated.

19B-57. Hand-Molding Kettle Covers. *Sheet Metal Worker,* v. 40, Mar. 1949, p. 46, 48.

Methods for shaping and machining stainless-steel kettle tops 12½ ft. in circumference.

19B-58. Phosphate Coatings; Developments in Wire, Tube and Deep Drawing Applications. H. A. Holden and S. J. Scouse. *Automobile Engineer,* v. 39, Mar. 1949, p. 107-113.

See abstract from *Sheet Metal Industries,* item 19B-28, 1949.

19B-59. Erfahrungen beim Ziehen von dunnen Stahldrähten mit hoher Ziehgeschwindigkeit. (Experiences in the High-Speed Drawing of Thin Steel Wires.) Clemens Eisenhuth. *Stahl und Eisen,* v. 68, Jan. 29, 1948, p. 46-48.

With the aid of special machines it is possible to increase the rate of drawing of fine high-quality steel wires. Equipment and data.

19B-60. Cold Forming Stainless Steels. Lester F. Spencer. *Iron Age,* v. 163, Mar. 31, 1949, p. 58-64; Apr. 7, 1949, p. 93-99.

Part one: cold-forming techniques suitable for various grades of stainless. Stamping, drawing, bending, blanking, punching, bulging, etc. Part two: further modifications of drawing methods, annealing, pickling, tool materials, lubricants, and other pertinent factors.

19B-61. Making the Morris Minor Body. *Machinery* (London), v. 74, Mar. 17, 1949, p. 323-329.

Various press operations in production of small-sized British automobile.

19B-62. Making Aluminum Furniture From Extruded Tubing. *Machinery,* v. 55, Apr. 1949, p. 158-159.

19B-63. Crucible Steel Co. Completes Expansion of Cold Rolling Plant. *Machinery,* v. 55, Apr. 1949, p. 175-176.

Rolling and heat-treating equipment.

19B-64. Helve Hammer Forging Done to .001″ Tolerances. John C. McComb. *Steel Processing,* v. 35, Mar. 1949, p. 129-132.

Methods and equipment for accomplishing on special toolsteels. Principal items of manufacture are chisels, rivet sets, paving breakers, hollow drill steels.

19B-65. Hot Extrusion Methods Applied to Automotive Parts. Claud L. Stevens and Gustav Vennerholm. *Steel,* v. 124, Apr. 11, 1949, p. 82-85, 110.

Technique adopted by Ford. Economic and engineering advantages are said to be savings of 30% in steel, 65% labor, 80% floor space, 40% die costs, and excellent fiber flow conditions. Die design, cold sheared billets, high-temperature salt bath, and die cooling.

19B-66. Application of a Microhardness Method to Evaluation of the Cold Working of Surface Layers of the Sides of a Drilled Hole. (In Russian.)

M. Ya. Freidkin. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1450-1455.

Experimentally confirms the applicability of the technique. As a result of drilling, a thin surface layer of cold worked metal having hardnesses considerably in excess of that of the base material is formed.

19B-67. Distribution of Cold Hardening Around a Conic Impression. (In Russian.) F. S. Savitskii, B. A. Vandyshev, and M. V. Yakutovich. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1476-1479.

The distribution of cold hardening in the part of the test specimen deformed by the conical indenter. Methods of investigation.

19B-68. Production of Mild Steel Rings. *Machinery* (London), v. 74, Apr. 7, 1949, p. 445. Translated from *Technische Rundschau*, v. 40, Dec. 24, 1943, p. 29.

Flat mild steel rings of 13⅝ in. external and 11¾ in. internal diam. and 3/16 in. thick were produced, with practically no waste, from strip material of 1 by 3/16 in. section by winding it onto a mandrel.

19B-69. Some Reflections on the Investment Casting Process. D. F. B. Tedds. *Foundry Trade Journal*, v. 86, Mar. 31, 1949, p. 279-282; Apr. 7, 1949, p. 315-317.

Advantages and disadvantages of various methods for carrying out the process. Position taken to date by British industry.

19B-70. Modern Methods & Machines Keep Chevrolet Cross Member Job at Peak Production. P. D. Aird. *Modern Industrial Press*, v. 11, Apr. 1949, p. 13-14, 18, 22, 54.

Blanking-press operation.

19B-71. "Integrated Department" Practice in Fabrication at American Stove. Gerald E. Stedman. *Modern Industrial Press*, v. 11, Apr. 1949, p. 36, 38, 40, 52.

Press and welding operations.

19B-72. Hollow Metal Doors—One of Many Metal Specialties Produced at Dahlstrom Metallic Door Co. of Jamestown, N. Y. Walter Rudolph. *Modern Industrial Press*, v. 11, Apr. 1949, p. 42, 44, 46, 48.

Press operations.

19B-73. Making Windscreen Wiper Equipment; Methods Employed by Trico-Folberth, Ltd., Brentford, Middlesex. *Machinery* (London), v. 74, Apr. 7, 1949, p. 431-436.

Forming and machining operations.

19B-74. Bending Heavy Bars and Structural Shapes on Bulldozers. *Machinery* (London), v. 74, Apr. 7, 1949, p. 437-439.

Hydraulically-operated bulldozers for bending bars, tubes, angle-iron, and channels, of thick section.

19B-75. Looping and Repeating on Merchant Mills. W. J. Barry. *Iron and Steel Engineer*, v. 26, Apr. 1949, p. 110-113; discussion, p. 113-115.

Hand looping was replaced by completely mechanized repeating on the 10 in. mill at the Lebanon plant of Bethlehem Steel Co. Diagrams of parts.

19B-76. Carnegie-Illinois Steel Corp. Modernizes Cold-Reduction Facilities at Gary. *Iron and Steel Engineer*, v. 26, Apr. 1949, p. 122-123.

Capacity for production of tinplate and sheet steel was increased by extensive additions of new equipment and revision and replacement of existing facilities.

19B-77. Press Operations Produce Tricky Part. L. A. Young, Jr. *American Machinist*, v. 93, May 5, 1949, p. 88-89.

Solution of problem of low-cost mass production of steel retainer cap for the Thompson Roto-Cap, a device for positive rotation of engine valves while in operation. Cold stamping overcame obstacles of shape and tolerance after other methods of manufacture proved too costly.

19B-78. Die Ermittlung der Breitenzunahme beim Warmwalzen von Stahl auf glatter Walzbahn. (Determining Lateral Expansion in Hot-Rolling of Steel on Smooth Rolling Mills.) Werner Lueg. *Archiv fur das Eisenhuttenwesen*, v. 20, Jan.-Feb. 1949, p. 59-68.

Reduces the formulas developed by several authorities to a series of nomograms as an aid to the rolling-mill operator. 12 ref.

19B-79. Drop Forgings: Some Aspects of Die Life. H. J. Merchant. *Metal Treatment and Drop Forgings*, v. 16, Spring 1949, p. 3-11.

Modes of failure, effect of design, material specification, tooling, and forging factors.

19B-80. Die Sinking for Drop Forging. Part II. Die Room Equipment. John Mueller. *Steel Processing*, v. 35, Apr. 1949, p. 196-199.

Die block handling as related to die-room layout. (To be continued.)

19B-81. Heavy Forgings; Production for Marine Purposes. R. C. Benson. *Iron and Steel*, v. 22, Apr. 1949, p. 145-148; May 1949, p. 181-184.

Dimensional, shape and weight limitations of the various types.

19B-82. Feeder and Heater Speed Magnet Forming. Henry Orth. *American*

Machinist, v. 93, May 19, 1949, p. 119.
Equipment and procedure. An electronic heating unit powers the induction coil.

19B-83. Air Press Trims Segment Bevel Gears. Paul Bludau. *American Machinist,* v. 93, May 19, 1949, p. 122.
Tilted fixture for a standard pneumatic arbor press which permits cutting one flare from gear with each stroke of the press.

19B-84. Straightening Shafts. *Iron Age,* v. 163, May 12, 1949, p. 100.

Use of hydraulic press for straightening steel forgings on which pinions are subsequently cut.

19B-85. "Presses" Prove to Be Principal Tools at Fentron Steel Works. Howard E. Jackson. *Modern Industrial Press,* v. 11, May 1949, p. 13-14, 18, 38.

Seattle firm makes steel and aluminum frame windows; hollow metal doors and door frames; louvers and screen sections used in connection with the doors and windows; and complete service-station buildings and warehouses.

19B-86. "American Kitchens" Embody Many Press Techniques. Walter Rudolph. *Modern Industrial Press,* v. 11, May 1949, p. 22, 26, 28.

Production of steel kitchen equipment.

19B-87. Advanced Engineering Methods Step-up Production at Fowler Manufacturing Co. Gerald E. Stedman. *Modern Industrial Press,* v. 11, May 1949, p. 32, 34, 36, 38.

Forming and finishing procedures and equipment for manufacture of electric water heaters; foundry equipment; industrial cleaning apparatus; and demonstration trailers.

19B-88. Frost Wire Drawers and Weavers Continent Leaders. David C. McConnell. *Canadian Metals and Metallurgical Industries,* v. 12, May 1949, p. 14-17, 31-32.
Procedures and equipment for wire drawing, cleaning, galvanizing, and weaving of wire cloth.

19B-89. Auto Makers Find Supply Source in Bumper Crop. *Western Metals,* v. 7, May 1949, p. 28-29.

Production of automobile bumpers.

19B-90. Evolution of the Reversing Hot Strip Mill. T. W. Lippert. *Iron Age,* v. 163, May 19, 1949, p. 86-89.

19B-91. Crucible Opens Ultra Modern Mill. *Iron Age,* v. 163, May 19, 1949, p. 90-93.
New $18,000,000 stainless and alloy strip steel plant.

19B-92. Alloy Strip Hot Coiled During Reversing Passes at Crucible's Midland Works. *Steel,* v. 124, May 23, 1949, p. 94-96, 106, 108, 111.

Reels operating in overhead gas-fired furnace on either side of mill serve the new 66-in., 4-high reversing hot strip mill. Modern facilities for cold finishing stainless steels.

19B-93. Seigerungsverlagerung und Verformung beim Walzen von weichem Stahl nach Untersuchungen an einer Drahtstrasse. (Segregation Displacement and Deformation in the Rolling of Soft Steel on the Basis of Investigations in a Wire-Rod Rolling Mill.) Kurt Krebs. *Stahl und Eisen,* v. 66-67, July 17, 1947, p. 244-250.

Results of a systematic investigation into the causes of defects (brittleness, poor drawing properties, cracking, rough surface) in soft rolled steel wire which became apparent when the wire was converted into screws, rivets. 11 ref.

19B-94. Einfluss der Giess- und Walzbedingungen auf die Fussrissanfälligkeit von Schienen S 49. (Effect of Casting and Rolling Conditions on the Susceptibility of S-49 Rail Flanges to Cracking.) Walter Jäniche. *Stahl und Eisen,* v. 66-67, Aug. 14, 1947, p. 284-290.

Susceptibility depends greatly on the method of rolling, but very little on the method of casting. Structures of flanges rolled by three different methods; and welded and unwelded surface cracks. S-49 is a standard type rail used in Germany.

19B-95. Das Blockwalzen. (Bloom Rolling.) Mathieu Holzweiler. *Stahl und Eisen,* v. 66-67, Sept. 11, 1947, p. 315-318.
Importance of the above to the surface condition of the finished rolled product. Construction and calibration of 22 blooming mills compared; importance of edge sharpness of the grooves; examples of different types of grooves.

19B-96. Production of Plates. W. Louis Bunting. *Steel,* v. 124, May 23, 1949, p. 114, 116, 119-120, 122, 125-126, 128; May 30, 1949, p. 70, 72-73, 76, 78, 80, 83-84, 86.
Equipment and procedure for manufacture of steel plates.

19B-97. Loop Forming Cold Drawn Steel Strips, Using Tangent and Hydraulic Forming Machines. H. J. Hunter. *Steel,* v. 124, May 30, 1949, p. 59, 68.
Procedure used in three models of automatic pickup hay balers.

19B-98. Combination Die Produces 118% Faster. Walter J. Mahany.

American Machinist, v. 93, June 2, 1949, p. 101.

Crimped gutters are now made from drum-head shearings in one operation instead of four. With a progressive die, blanking and forming are now done on one press, and the shearing operation is eliminated.

19B-99. Automatic Transfer Presses Increase Stamping Output. E. E. Schroeder. *Iron Age,* v. 163, June 2, 1949, p. 60-66.

Verson transfer-feed presses for stamping range drawers, reflector rings, and drip pans for Hotpoint electric ranges.

19B-100. Ingenuity in Press Operation Affords Fabrication Savings. James M. Herendeen. *Steel,* v. 124, June 6, 1949, p. 120, 123.

Use of presses in fabrication of heavy equipment.

19B-101. French Wire Production; Equipment and Methods Described. W. A. Sandilands. *Wire Industry,* v. 16, May 1949, p. 421-423, 425.

Based on a tour by a British wire manufacturer's research manager.

19B-102. Press Work at General. Elmer L. Lipp. *Western Machinery and Steel World,* v. 40, May 1949, p. 98-99.

Fabrication of car accessories by the General Machine Works.

19B-103. Forging and Heat Treating of Sucker Rods Used in Oil Wells. *Iron and Steel Engineer,* v. 26, May 1949, p. 113-114.

19B-104. Compressed Air—An Important Aid in Forming Operations. Bartlett West. *Modern Machine Shop,* v. 22, June 1949, p. 134-136, 138, 140, 142.

Varied uses.

19B-105. Flexibility of Sheet Metal Operations Geared to "Mass-Produce" Diversified Tractor Components in Short-Run Lots. E. F. Ross. *Steel,* v. 124, June 13, 1949, p. 80-83, 120, 122.

Press equipment and procedures for gas-tank halves, hoods, grille fronts, grille tops, fenders, oil pans, flywheel dust shields, and drawbars.

19B-106. Hot Rolled Breakdowns Produced in Converted Geneva Plate Mill. *Steel,* v. 124, June 13, 1949, p. 106, 108.

19B-107. Process for Hot Drawing Wire Gives Excellent Physical Properties and Eliminates Repeated Annealing and Pickling Operations. Rheinhold Schempp. *Steel,* v. 124, June 13, 1949, p. 116, 118.

Hot-drawing equipment consists of a pay-off reel, a gas-fired lead bath in the form of a tube with gooseneck ends, automatic lubrication by means of a graphite spray between the exit of the lead bath and the drawing die, and the usual wire-drawing block with die holders and rotating variable-speed drum.

19B-108. Transfer Type Presses Speed Output of Electric Ranges. B. E. Schroeder. *Machinery,* v. 55, June 1949, p. 149-154.

Unusual mass-production techniques and welding procedures.

19B-109. Punching 1045 Hot Rolled Steel Tractor Draw Bars. *Tool & Die Journal,* v. 15, June 1949, p. 62-63.

A 1000-ton punching machine and other punching equipment installed to increase production.

19B-110. Economies in Refrigerator Cabinet Production. *Tool & Die Journal,* v. 15, June 1949, p. 87-88.

Combining a press brake and a tangent bender permits complete forming without welding.

19B-111. Automatic Forming From Flat Blanks to Final Complex Shape Performed on Bath "Multibenders". *Tool & Die Journal,* v. 15, June 1949, p. 88.

Procedure used.

19B-112. Précontraintes et durcissement superficiel des pieces d'acier. (Prestraining and Surface Hardening of Steel Pieces.) J. Pomey. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 46-54; Feb. 1949, p. 108-120; Mar. 1949, p. 163-180.

Modern theories of the straining process. Different methods of prestraining resulting in surface hardening and different factors involved in the process. 44 ref.

19B-113. Abkantungen und Abrundungen beim Walzenkalibrieren. (Bevelling and Rounding the Edges in the Grooving of Rolls.) Adolf E. Lendl. *Stahl und Eisen,* v. 69, Apr. 28, 1949, p. 306-308.

A method of calculating the "critical" bevel and the necessary bevel required to prevent formation of fins in box grooves.

19B-114. Gniot, wydluzenie i roztlaczanie w procesie walcowania na gorqco. (Draft, Spread, and Elongation in the Hot Rolling Process.) Z. Wusatowski. *Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa* (Reports of the Metallurgical and Foundry Research Institute), no. 1, 1949, p. 27-58.

Improved formulas as applied to steel. 37 ref.

19B-115. Rolls and Rolling. Parts V and VI. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, May 1949,

p. 543-549; June 1949, p. 698-704, 706.
Pass profiles for cross-country billet mills, finishing mills, and continuous mills. Relative merits of various combinations of shapes. (To

19B-116. Safety Is a "Must" Factor in Propane Tank Manufacture. *Western Metals,* v. 7, June 1949, p. 24-25.
Manufacture of acetylene gas cylinders and containers for liquefied petroleum gas. Press forming, surface cleaning, and welding.
be continued.)

19B-117. Plastic Strain and Hysteresis in Drawn Steel Wire. R. S. Brown. *Journal of the Iron and Steel Institute,* v. 162, June 1949, p. 189-200.
None of the present tests is suitable for determining the properties of wire required to withstand dynamic stresses. Stress-strain characteristics at loads up to 75% of ultimate tensile strength. Effect of temperature during wire-drawing and relation to behavior of heat-treated wires subjected to combined bending and dynamic stresses.

19B-118. Production of Hot and Cold-Rolled Strip and Sheets. Charles L. McGranahan. *Steel,* v. 124, June 6, 1949, p. 106-108, 110, 112, 114, 117; June 13, 1949, p. 88-90, 92, 94, 96, 98, 101; June 20, 1949, p. 106-108, 110, 112, 114, 117.
Equipment and procedures for ferrous materials. First installment—tabular classifications of hot and cold rolled plates, bars, strip, and sheets. June 13 issue describes the trip of a slab through the scale breaker, roughing stands, finishing stands, run-out tables, coilers, and pilers of a modern continuous hot strip mill. Also the hot Steckel mill. In June 20 issue quality classifications for sheets, finishing of hot rolled sheets, sheet pickling, shearing lines, and the continuous pickling process. (To be continued.)

19B-119. Automation Principle Applied to Production of Axle Housings. Joseph Geschelin. *Automotive Industries,* v. 100, June 15, 1949, p. 34-36, 64.
Procedures and equipment for producing 2000 completely machined rear-axle housings in an 8-hr. day. Automatic transfer and press operations are largely utilized.

19B-120. Pressless Dies Operate in Sequence. Cyril Bath. *American Machinist,* v. 93, June 16, 1949, p. 85.
Self-operated dies, first applied to forming refrigerator cases, now utilized in complex forming of dishwasher and other sheet parts.

19B-121. Progressive Dies Form House Panels. *Iron Age,* v. 163, June 16, 1949, p. 92.
Use by Lustron Corp.

19B-122. Hints on Forging. John E. Anderson. *Western Machinery and Steel World,* v. 40, June 1949, p. 75-77.
Practical recommendations.

19B-123. Fasteners Hold Everything. Price Berrien. *Western Machinery and Steel World,* v. 40, June 1949, p. 90-93.
Procedures and equipment for manufacture of a variety of bolts, screws, and nuts. Miscellaneous operations such as cold heading, heat treating, cleaning and finishing, thread rolling, carburizing, plating.

19B-124. Geneva Steel Converts Plate Mill. *Iron and Steel Engineer,* v. 26, June 1949, p. 76.
Conversion of 132-in. semicontinuous plate mill permits production of coiled, hot-rolled breakdowns as well as continued production of high-quality steel plates. Mill characteristics.

19B-125. Maximum Ingot Yield by Proper Planning. W. G. Smith. *Iron and Steel Engineer,* v. 26, June 1949, p. 96-99; discussion, p. 99.
Recommendations for each step between ingot and finished product.

19B-126. Crucible Opens New Mill at Midland, Pennsylvania. *Iron and Steel Engineer,* v. 26, June 1949, p. 120-122.
New hot and cold rolled sheet and strip mill designed for stainless and special-alloy steels.

19B-127. Die Polishing. *Wire Industry,* v. 16, June 1949, p. 487.
Procedures for polishing tungsten-carbide wire-drawing dies and importance of careful polishing to increase die life and improve quality of the products.

19B-128. Forging Crankshafts One Throw at a Time. H. Malcor. *Iron Age,* v. 163, June 23, 1949, p. 71-73.
"RR" method, developed in France, which utilizes rolled or forged bar stock. The operation involves one stroke of the press to upset the webs and displace the metal forming the pin. The use of smaller ingots, less machining, uninterrupted grain flow throughout the length of the shaft, and adaptability of equipment to a variety of crankshaft sizes are some of the advantages claimed.

19B-129. New Facility for Drawing Stainless Wire. *Steel,* v. 124, June 27, 1949, p. 82, 85-86.
Production of wire rounds ½-in. and finer.

19B-130. Hydraulic Presses Speed Electric Motor Assembly. *Steel,* v. 125, July 11, 1949, p. 98.
Use of the above in building traction motor armatures at Westing-

house. Two presses are employed in the armature core-building section to press armature laminations and commutators on the shafts.

19B-131. The Use of Phosphate Coatings in Wire, Tube, and Deep Drawing. H. A. Holden and S. J. Scouse. *Machinery* (London), v. 74, June 16, 1949, p. 803-805. A condensation.

Previously abstracted from *Sheet Metal Industries.* See item 19B-28, 1949.

19B-132. Production of Hot and Cold Rolled Strip and Sheets. Parts IV-VI. Charles L. McGranahan. *Steel,* v. 124, June 27, 1949, p. 66-68, 70, 73, 76; v. 125, July 4, 1949, p. 83-84, 86, 89-90, 92, 95; July 11, 1949, p. 106, 108, 111-112, 114, 116.

Part IV defines and discusses cold rolled carbon steel sheets and strip. Various types of mills used in production. Part V describes tandem units; annealing procedure and equipment. Part VI discusses temper rolling, shearing lines, stretcher leveling, inspection and oiling, porcelain enameling sheets, and the above. (To be continued.)

19B-133. To Die Forgings for Lower Costs. *Product Engineering,* v. 20, July 1949, p. 102.

Compares a conveyor shaft made by hammer die forging to one made by upset die forging. Also compares a cast and a drop-forged cover plate.

19B-134. American Steel and Wire Company Opens Stainless Division at Waukegan. *Iron and Steel Engineer,* v. 26, July 1949, p. 74-76, 78.

New mill equipped exclusively to process rounds ½ in. and smaller and certain sizes of flat stainless steel wire.

19B-135. Dry-Type Drawing Compounds for the Deep Drawing of Sheet Steel. R. W. Piper. *Finish,* v. 6, July 1949, p. 23, 46.

Advantages claimed over fluid lubricants.

19B-136. Fabrication, Metal Preparation, Enameling—Sinks, Bathtubs and Washing Machine Tubs. Part II. A Photo Story of Washing Machine Tub Production at Ingersoll Steel. *Finish,* v. 6, July 1949, p. 36-37.

19B-137. (Book). **Cold Shaping of Steel —Summary Report.** 138 pages. 1949. Library of Congress, Photoduplication Service, Publication Board Project, Washington 25, D. C. (Office of Technical Services, PB96704.) Photostat, $17.50; microfilm, $5.50.

Extensive new data on the cold extrusion of steel. Covers work done for the Army by Heintz Manufacturing Co. to adopt German-developed technology in this field to American production. An important section deals with development of efficient, automatic "phosphatizing."

19B-138. Huge Hammer Anvils Forged at Homestead Works, CIS. John C. McComb. *Steel Processing,* v. 35, June 1949, p. 291-293.

Forging by above works of a 142-ton anvil for a 12,000-lb. forging hammer. This is believed to be the largest hammer base produced by this method.

19B-139. The Drop Forge Industry Today; A Look Ahead. Part II. Robert E. W. Harrison. *Steel Processing,* v. 35, June 1949, p. 320-322.

Present status and future prospects.

19B-140. Multiple-Action Press Tool for Air Cleaner Casings. *Machinery* (London), v. 74, June 30, 1949, p. 879-880.

Used on 0.024-in. mild-steel sheet.

19B-141. New $18,000,000 Rolling Mill for Sheet and Strip Stainless Steel. *Machinery,* v. 55, July 1949, p. 210-211.

New mill at Midland, Pa., works of Crucible Steel Co. of America.

19B-142. Press Work at Inglewood. James Corcoran. *Western Machinery and Steel World,* v. 40, July 1949, p. 76-77.

Equipment and procedures. The largest lighting-fixture manufacturer in the West and one of the largest producers of standard and trailer sinks and lavatories, the company does a large business in contract fabrication, stamping, and porcelain enameling.

19B-143. Extrusions Last Longer, Cost Less Than Forgings. *SAE Journal,* v. 57, July 1949, p. 43-47. Based on "The Application of Hot Extrusion Methods for Automotive Production", by Claud L. Stevens and Gosta Vennerholm.

Comparative properties of automotive front-wheel spindles made by the two methods. Numerous advantages of extrusion. Includes reply to discussion by R. A. Mitchell and T. A. Hewson, but not the original discussion.

19B-144. Rolls and Rolling. Part VII. E. E. Brayshaw. *Blast Furnace and Steel Plant,* v. 37, July 1949, p. 821-830.

Roll passes for producing round bars. Various combinations. (To be continued.)

19B-145. Well-Engineered Press Set Up Makes Two Fenders At Once. P. D. Aird. *Modern Industrial Press,* v. 11, July 1949, p. 13-14, 18.

19B-146. Forging and Heat Treating of Oil Well Sucker Rods. *Industrial*

Heating, v. 16, July 1949, p. 1164-1166, 1168, 1184.

Procedures and equipment.

19B-147. Carnegie-Illinois Modernizes Cold-Reduced Sheet and Tin Plate Production at Gary. *Industrial Heating,* v. 16, July 1949, p. 1204-1206, 1208, 1210, 1212.

19B-148. Pipe-Hungry Industries Welcome New Texas Fabricating Company. *Western Metals,* v. 7, July 1949, p. 28-29.

Procedures and equipment for fabrication of large-diameter steel pipe by forming and welding.

19B-149. Huge Press Stamps Out 260 Flywheels Per Hour. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 46.

2000-ton press, recently installed at Pontiac Motor Division.

19B-150. Recent Developments in Steel Processing. J. A. Kilby and W. G. Cameron. *Transactions of the Institution of Engineers and Shipbuilders in Scotland,* v. 91, 1948, p. 81-135; discussion p. 135-139.

An earlier paper dealt with the manufacture of the steel ingot; the present paper, rolling of the ingot into the many and varied forms in which it is supplied to the steel-consuming industries. Construction of heating and reheating furnaces and rolling equipment. 171 ref.

19B-151. Applications of Hot Extrusion Methods. Claud L. Stevens and Gustav Vennerholm. *Steel Processing,* v. 35, July 1949, p. 363-367.

See abstracts from *SAE Journal,* and *Steel,* item 19B-143, and 19B-65, 1949.

19B-152. Use of Transfer Type Presses in the Production of Electric Cookers. B. E. Schroeder. *Machinery* (London), v. 75, July 21, 1949, p. 83-87.

19B-153. Effect of Plastic Strain and Heat Treatment. C. J. Osborn, A. F. Scotchbrook, R. D. Stout, and B. G. Johnston. *Welding Journal,* v. 28, Aug. 1949, p. 337s-353s.

Progress report No. 3 on the effect of fabrication processes on steels used in pressure vessels. Effects on the tensile and notch properties of a rimmed and a killed steel.

19B-154. Cold Shaping Steel. *Steel,* v. 125, July 25, 1949, p. 58-60, 94, 96, 99; Aug. 1, 1949, p. 74-77.

Practicability for low-carbon steels by extrusion with the aid of special surface treatments. Processes in terms of both industrial and ordnance applications. Phosphatizing processes and their importance in facilitating the above.

19B-155. Hobbing Cavities in Alloy Steels. John Sekowski. *Tool & Die Journal,* v. 15, Aug. 1949, p. 42-44.

Selection of alloys, safety precautions, and hob design.

19B-156. New Stainless Steel Division of the American Steel & Wire Co. *Machinery,* v. 55, Aug. 1949, p. 165.

Equipment for production of stainless-steel wire ½ in. in diameter and finer, as well as certain sizes of flat wire.

19B-157. When To Use Steel Drop Forgings for Stressed Parts. Kenneth Rose. *Materials & Methods,* v. 30, Aug. 1949, p. 63-65.

Redesigning highly stressed parts for drop forging often results in closer tolerances and reduced weight while still meeting the same strength requirements.

19B-158. New Cut-Wire Shot Big Boon to Peening. H. H. Miller. *SAE Journal,* v. 57, Aug. 1949, p. 44-51.

Shot is made by cutting MB hard-drawn mechanical spring wire into lengths which are equal to the diameter. Most of the experience to date is with shot made from 20-gage wire, although larger and smaller sizes are available. Peening is said to have been a costly and comparatively uncontrollable operation because of excessive shot usage, short life, grit formation, and lack of size and quality uniformity of the shot. Experience with above shot for peening automotive chassis springs indicates that these drawbacks are overcome.

19B-159. Pacific Coast Plant Extends Barmaking Facilities. R. J. Tremblay. *Steel,* v. 125, Aug. 1, 1949, p. 96, 98, 100.

New mill with 21 horizontal stands and equipped with phenolic-resin type bearings. Handling of coils.

19B-160. "Perfectly Shaped" Cones Produced by Plate Bending Roll. *Steel,* v. 125, Aug. 1, 1949, p. 103.

New method of forming cones in 1-in. steel plates.

19B-161. Cold Extrusion of Steel. T. E. Lloyd and E. S. Kopecki. *Iron Age,* v. 164, Aug. 4, 1949, p. 90-105.

New technique developed by Heintz Mfg. Co. for the Army. Original work was done by the Germans on deep-drawing carbon steel. However, the process has now been extended to high-carbon steels and various alloy steels containing Cr, Ni, Mn, and Mo. Information on die design, die lubricants, types of metals that can be extruded, and resulting physical properties. Particular emphasis is placed on die lubricants, the key to the success

of this new process; and on improvement of metallurgical characteristics.

19B-162. Three Operations Produce Forming Dies from Locomotive Axles. *Steel*, v. 125, Aug. 8, 1949, p. 82.

Use of forging, flame-cutting and automatic submerged welding to convert scrap locomotive axles into large press dies for forming car parts.

19B-163. Spinning Stainless Parts. E. F. Ross. *Steel*, v. 125, Aug. 15, 1949, p. 90-92, 112.

Procedures and equipment for spinning parts such as tank bottoms, half spheres, bowls, strainers, covers for bottling machines, and steam-jacketed kettles.

19B-164. Surface Strengthening by Cold Rolling. *Metal Progress*, v. 56, Aug. 1949, p. 254, 256. Translated and condensed from "Measuring the Stresses and Plastic Deformations in Surface-Pressed Test Bars", Hayo Föppl, *Mitteilungen des Wöhler-Institute*, no. 41, 1948, 67 pages.

Results of a thorough experimental investigation of hardening of cylindrical pieces by pressure rolling. Ninety tests were made on a spring and an alloy steel.

19B-165. Production of Structural Shapes and Rails. Part I & II. Frederick M. Gillies and Wilbur E. Dittrich. *Steel*, v. 125, Aug. 22, 1949, p. 82, 85-86, 88, 93-94, 96; Aug. 29, 1949, p. 74, 76, 78, 81, 82.

Three successful and efficient structural mills used today. Duties of the roller and roll designer in the successful production of many intricate sections. History of rails and their production from 1830 to date. Branding, end-hardening, and testing.

19B-166. Torrance Plant Forges 'Kellys'. *Western Metals*, v. 7, Aug. 1949, p. 22.

A "Kelly" is the metal link that transmits the driving power of an oil rig's engines to the string of drill pipe. Forging operations.

19B-167. Straight-Line Production Emphasized at Lincoln Electric Co. Walter Rudolph. *Modern Industrial Press*, v. 11, Aug. 1949, p. 20, 22, 24, 26.

A variety of press operations and equipment used in production of welding equipment.

19B-168. Back-Pull Wire Drawing in Practice: Investigation Report. J. G. Wistreich. *Wire Industry*, v. 16, July 1949, p. 573-575, 577.

An investigation under industrial conditions done on the prototype of a machine of novel design known as the "Pathfinder". Results revealed no important advantages of back-pull drawing, either with respect to power saving or increased die life.

19B-169. The "Pathfinder" Machine: Description and Capabilities. *Wire Industry*, v. 16, July 1949, p. 577, 579-580, 589.

Back-pull wiredrawing machine used in the experiments described in the preceding article. (See item 19B-168.)

19B-170. The Manufacture of Metal Containers; Some Aspects of Production Procedure. *Sheet Metal Industries*, v. 26, July 1949, p. 1439-1443.

Quality of tinplate, cost of handling, production control, container manufacture, cutting, stamping the bottoms and tops, defects in stamping, and curling. (To be continued.)

19B-171. Le nouveau laminoir à froid de la fonderie Boillat S. A. à Reconvilier . . . Ein Neues Kaltwalzwerk der Fonderie Boillat Ag., Reconvilier. (A New Cold Rolling Mill at the Boillat Foundry Co. in Reconvilier.) *Pro-Metal*, v. 2, June 1949, p. 421-426.

19B-172. Die Blockstrasse im Edelstahl-Walzwerk. (The Blooming Mill Train in the Alloy-Steel Rolling Mill.) Erwin Alfred Spenlé. *Stahl und Eisen*, v. 69, June 23, 1949, p. 443-450.

Dimensions and position of the above from the standpoint of greatest possible economy, showing differences between ordinary and alloy-steel rolling mills.

19B-173. Stamping and Enameling Improves Products. Thomas A. Dickinson. *Steel Processing*, v. 35, Aug. 1949, p. 413-414, 434.

Equipment and procedures used with lightweight steel sheets.

19B-174. Die Sinking for Drop Forging. Part IV. Preparing the Blocks for Sinking. John Mueller. *Steel Processing*, v. 35, Aug. 1949, p. 415-417, 444-445.

Various operations involved.

19B-175. Induction Annealing Simplifies Metal Forming. L. R. Mueller. *Iron Age*, v. 164, Sept. 1, 1949, p. 69-71.

Use of induction heating to selectively soften sheet steel for forming operations permits use of hard sheets where proper tempers for forming are not available from stock. Case histories where high breakage rates and expensive salvage work have been overcome by use of this technique.

19B-176. Geneva Rolls Steel Coil. *Western Machinery and Steel World*, v. 40, Aug. 1949, p. 88-89.

Procedure and equipment for rolling plates and coils.

19B-177. Production of Butt and Lap

Welded Pipe Conduit and Electric Metallic Tubing. H. E. Engelbaugh. *Steel,* v. 125, Sept. 5, 1949, p. 92, 94, 97-98, 100, 103-104, 106, 109.

Development of pipemaking from its inception 5000 years ago up to present-day processes. All types with the exception of seamless tubes are discussed in detail. Principal procedures are forming, welding, and finishing. Nonferrous pipe is not considered.

19B-178. Increasing Output by the Use of Carbide Lamination Dies. *Machinery* (London), v. 75, Aug. 18, 1949, p. 219-221.

Used to produce rotor and stator laminations for electric shavers.

19B-179. Das Schmieden von Walzen unter besonderer Berücksichtigung der hierfür verwandten Schmiedeeinrichtungen. (Forging of Rolls, With Special Consideration to the Forging Equipment Required.) B. Wiele. *Archiv für Metallkunde,* v. 2, Nov. 15, 1948, p. 205-207.

Development of forging presses, design and operation of a modern forging plant, the forging operation, and the forging of large rolls of carbon and chromium steel.

19B-180. Rod and Billet Mill Highlights CF & I Modernization Program. *Iron Age,* v. 164, Sept. 15, 1949, p. 78-79.

New equipment of Minnequa Works, Pueblo, Colo.

19B-181. Tungsten Carbide Tooling for Cold Heading. Part I. W. E. Montgomery, W. Leigh, and W. H. Phillips. *Steel Processing,* v. 35, Aug. 1949, p. 407-412.

Characteristics of several tungsten carbide grades for cold heading. Procedure and variations. (To be continued.)

19B-182. Keystone's New Rod Mill. *Wire and Wire Products,* v. 24, Sept. 1949, p. 775, 787-788.

19B-183. Die Making Techniques for Drawing Austenitic Stainless Steel. William Slinkard. *Production Engineering & Management,* v. 24, Sept. 1949, p. 47-52.

Large savings in production costs in the fabrication of exhaust manifolds for internal combustion engines and also fuel manifolds, exhaust cones, combustion tubes, aft frames, and tail pipes for jet engines.

19B-184. Dual Die Setup Completes Steel Cabinet Body at Each Press Stroke. Herbert Chase and C. M. Lumley. *Steel,* v. 125, Sept. 19, 1949, p. 76-77, 108, 111.

19B-185. Exacting, Ingenious Presswork Goes Into Manufacture of Modern Truck Tank. P. D. Aird. *Modern Industrial Press,* v. 11, Sept. 1949, p. 13-14, 46, 48.

Manufacture at Brown Steel Tank Co., Minneapolis; includes welding.

19B-186. Highlights of Steel Fabricating at Johnstown-Lorain Works of Carnegie-Illinois Steel Corporation. Walter Rudolph. *Modern Industrial Press,* v. 11, Sept. 1949, p. 22, 26, 28.

Miscellaneous press equipment.

19B-187. Presses Contribute to Steady Growth of Heating Assurance Corp. Howard E. Jackson. *Modern Industrial Press,* v. 11, Sept. 1949, p. 38, 40, 42.

Production of heating and ventilating equipment; includes spot welding.

19B-188. Impact Extrusion of Hexagon Steel Bolts. *Machinery* (London), v. 75, Sept. 8, 1949, p. 347.

Development of Swiss firm.

19B-189. 120-Million-Pound Push. James Blane. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 100, 110.

High-pressure presses. Compares those of the western world with the much larger German ones.

19B-190. Drawing Die Lubricant. J. C. Heymann. *Metal Progress,* v. 56, Oct. 1949, p. 497-498.

An efficient phosphating compound used preparatory to cold drawing of steel tubing.

19B-191. Impact Stamping Cuts Cost in Forming Metallic Sheet and Plate. Thomas A. Dickinson. *Western Metals,* v. 7, Sept. 1949, p. 19-22.

"Impact stamping" is an unprecedented, efficient, and inexpensive method of forming metallic sheet and plate materials with rope-type drop hammer equipment. Principles of process.

19B-192. Western Tool Company Combines Special Techniques. *Western Metals,* v. 7, Sept. 1949, p. 24-25.

Use of punch presses for hot-forging operations. Tools are made from SAE 4140 steel.

19B-193. Stepping Up Production With Hydraulic Metalworking Presses. Frank M. Scotten. *Production Engineering & Management,* v. 24, Oct. 1949, p. 51-54.

Procedures used at Nineteen Hundred Corp., St. Joseph, Mich.

19B-194. Modern Forging Techniques for Mass Produced Components. *Production Engineering & Management,* v. 24, Oct. 1949, p. 55-62.

Procedures and equipment used by the Chevrolet Forge Division for forging 1250 tons of steel per average working day.

19B-195. The Manufacture of Domestic

Refrigerators. *Machinery* (London), v. 75, Sept. 22, 1949, p. 403-411.

Assembly of compressors and production of cabinets at British steel firm using pressing operations.

19B-196. Verfahren zur Erleichterung des Ziehvorganges hochlegierter Stähle. (Method of Facilitating the Drawing of High-Alloy Steels.) F. Rossteutscher. *Archiv für Metallkunde,* v. 3, Aug. 1949, p. 282-283.

A patented method for treating high-alloy steels with oxalic acid solution mixed with soluble sulfides or H_2S. 10 ref.

19B-197. Streckung und Wanddickenänderung beim Walzen von nahtlosen Strahlrohren auf dem Reduzierwalzwerk. (Elongation and Change in Wall Thickness in the Rolling of Seamless Tubes on the Reducing Rolling Mill.) Walter Boettcher and Anton Pomp. *Stahl und Eisen,* v. 69, Sept. 1, 1949, p. 615-624; discussion, p. 624-626.

Factors that affect the above, in particular, the effect of structural design of the rolling mill, of initial dimensions of the bloom, and of method of rolling. 13 ref.

19B-198. Die Formänderung von Rohren im Einzelkaliber des Reduzierwalzwerks. (Change of Shape of Tubes in a Single Pass of a Reducing Rolling Mill.) Rudolf Hartjenstein. *Stahl und Eisen,* v. 69, Sept. 1, 1949, p. 626-630.

Effects of groove design, rolling temperature, and wall thickness of tube on the reducing and elongating action of the mill and on the condition of the finished tubes.

19B-199. Plastic Strain and Hysteresis in Drawn Steel Wire. R. S. Brown. *Wire and Wire Products,* v. 24, Oct. 1949, p. 891, 894-899, 902-907, 992.

Previously abstracted from *Journal of the Iron and Steel Institute.* See item 19B-117, 1949.

19B-200. Magnet Wire Plant—Fort Wayne Works, General Electric Co. F. A. Arnold. *Wire and Wire Products,* v. 24, Oct. 1949, p. 908-911, 914-915.

Processes and production methods used in manufacture of magnet wire.

19B-201. Processing of Stainless Steel Wire. Stanley P. Watkins. *Wire and Wire Products,* v. 24, Oct. 1949, p. 916-917, 920-923, 968-972.

Some recent advances including rolling, drawing, annealing, pickling, and electropolishing.

19B-202. Reclaiming Railroad Rail Joints. Will C. Grant. *Industrial Gas,* v. 28, Oct. 1949, p. 7-8, 24-26.

Rail joints are special steel plates which join the rails. Five plants in the U. S. are engaged in reclaiming worn joints by a reforming process. Forging and heat treatment procedures and equipment.

19B-203. Hobbing Mold Cavities in Alloy Steels. John Sekowski. *Machinery,* v. 56, Oct. 1949, p. 150-151.

19B-204. Stamping Expedites Steel Burial Casket Output. W. E. Barrott, Jr. *Iron Age,* v. 164, Oct. 13, 1949, p. 69-73.

The number and speed of operations normally required have been reduced by use of a hydraulic press with dies that rapidly draw, form, trim, and pierce components of the above. A welded assembly has proved much stronger than the previous method of soldering.

19B-205. New Method Simplifies Drawing of Front Fenders. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 36-37.

"Revolutionary" technique developed by Pontiac Motor Div. The basic feature is preliminary formation of the nose section in the blank before the blank is presented to the drawing die. Formation of the nose is accomplished in a special machine, incorporating a seam welder. At the completion of nosing, the seam welding roll is guided upward by a track while welding the joint. Contrary to conventional practice, only a single drawing operation is then required to produce the fender.

19B-206. Standardizing Cuts Die Costs. Ernest C. Noreen. *American Machinist,* v. 93, Oct. 20, 1949, p. 104-105.

Three segmental dies, with interchangeable punch and die blocks and spacers fastened in master holders, can form, cut off, and pierce all required sizes of chain side links.

19B-207. New Criteria for Predicting the Press Performance of Deep Drawing Sheets. W. T. Lankford, S. C. Snyder, and J. A. Baucher. *American Society for Metals,* Preprint No. 30, 1949, 31 pages.

Evidence refuting the belief that an isotropic material is more suitable for all types of sheet metal forming operations than an anisotropic material. For certain unsymmetrical formations, material having a considerable degree of plastic anisotropy of a favorable nature results in the best press performance. Work was confined to Al-killed deep drawing sheet steel. 15 ref.

19B-208. Production of Seamless Steel Pipe and Tubes. Bryant Bannister. *Steel,* v. 125, Oct. 17, 1949, p. 86, 88, 91, 94, 96; Oct. 24, 1949, p. 68, 70, 72, 74, 76.

Equipment and procedures. Part I: billet heating, piercing, plug rolling, and reeling. Part II: seamless tube rolling process used today. The new

continuous tube-rolling mill now being installed by National Tube Co.

19B-209. New Rod Mill To Increase Production at Colorado Fuel and Iron Corp. *Steel*, v. 125, Oct. 24, 1949, p. 58-60, 82, 85-86.

New mill which will roll 4⅜-in. square billets through 27 passes into finished coiled rods.

19B-210. Mass Press-Forming Figures Prominently in Steel House Production. *Steel*, v. 125, Oct. 24, 1949, p. 64-65.

Forming and finishing operations at Lustron Corp.

19B-211. Press Work Behind the Iron Fireman. Walter Rudolph. *Modern Industrial Press*, v. 11, Oct. 1949, p. 36, 38, 40.

Press operations and equipment in production of "Iron Fireman" heating units for automatic burning of coal, oil, or gas. Includes welding, machining, and finishing.

19B-212. A Modern Rod Mill for Rolling Stainless Steels. Edward T. Peterson, Lewis W. King, and Edward C. Peterson. *Iron and Steel Engineer*, v. 26, Oct. 1949, p. 99-109; discussion, p. 109.

Development of modern layouts for mechanized rolling of stainless. Mechanization has been made feasible in spite of several inherent problems peculiar to the material.

19B-213. Hobbing Cavities in Alloy Steels. John Sekowski. *Steel*, v. 125, Oct. 31, 1949, p. 62-63.

How long-running, trouble-free cavities for molding plastics can be produced economically by hobbing techniques.

19B-214. New Criteria for Predicting Press Performance of Deep Drawing Sheets. W. T. Lankford, S. C. Snyder, and J. A. Bauscher. *Steel Processing*, v. 35, Oct. 1949, p. 550-551, 563.

Previously abstracted from *American Society for Metals*, Preprint No. 30, 1949. See item 19B-207, 1949.

19B-215. Flame Fabricating Structural Steel. F. H. Dill. *Steel*, v. 125, Nov. 7, 1949, p. 128, 160, 162, 165.

Use of oxy-acetylene equipment for local heating, straightening and forming, fabricating large structures, cambering beams, and heating flanges.

19B-216. Cupping Thick Steel Blanks. G. Sachs, G. Espey, and J. Taub. *Steel*, v. 125, Nov. 7, 1949, p. 112-115; Nov. 14, 1949, p. 87-90, 92, 94.

Experimental methods used to study cupping phenomena, contours of cupping dies, stress and strain relations, breaking conditions, cupping, and ironing forces.

19B-217. Experimental Determination of Metal Drawing and Forming Forces. Arthur R. Kimbell. *Proceedings of the Society for Experimental Stress Analysis*, v. 7, no. 1, 1949, p. 51-60.

Application of wire strain gages to the problem of load measurement on cupping and redrawing dies used in drawing various sizes of nuts from strip steel.

19B-218. Forging Techniques in a New Ford Plant. Charles H. Wick. *Machinery* (American), v. 56, Nov. 1949, p. 136-145.

Induction and high-speed gas heating, multiple and hot extrusion forging, and isothermal annealing are some of the methods used in producing 1,000,000 lb. of forgings per day.

19B-219. High Production of Difficult Stampings for the New Studebaker. William R. Myers. *Machinery* (American), v. 56, Nov. 1949, p. 180-185.

Spinner-type grilles, one-piece fenders, and "down-swept" hoods are among the stampings required. Methods of forming such components smoothly and to close dimensional accuracies at high production rates.

19B-220. Hot-Worked Cast Iron. E. Piwowarsky and A. Wittmoser. *Engineers' Digest*, v. 10, Oct. 1949, p. 348-350. Translated and condensed from *Zeitschrift für des Vereines Deutscher Ingenieure*, v. 91, Apr. 15, 1949, p. 183-185.

Development of high-strength cast irons by hot working, especially over the past 15 years at the Foundry Institute of Aachen Technical University. Comparative mechanical properties.

19B-221. How Ford Stamps Lamp Parts. Frank W. Gawronski. *Steel*, v. 125, Nov. 28, 1949, p. 60-61.

Equipment and procedures.

19B-222. Plate Mill Modernization at Central Iron & Steel. John Anthony. *Iron Age*, v. 164, Nov. 24, 1949, p. 70-72.

Plate-mill capacity has been virtually doubled at the Harrisburg plant by adding a blooming and slabbing mill, together with soaking pits, continuous slab-heating furnaces, and other improvements. Problems of the openhearth shop have also been simplified by eliminating need for many of the small-slab-size ingots and for bottom pouring.

19B-223. A Four-High Reversing Cold Strip Mill. Lloyd L. Wilson. *Iron and Steel Engineer*, v. 26, Nov. 1949, p. 71-74; discussion, p. 74-75.

Driven back-up rolls enable use of smaller working rolls, and with front

and back tension. The result is a modern all-purpose mill.

19B-224. Modernization of the Steelton Blooming Mill. Russell M. Weigle. *Iron and Steel Engineer,* v. 26, Nov. 1949, p. 97-100; discussion, p. 100-103.

Pit furnaces; ingot handling; mill-motor control; and blooming-mill tables.

19B-225. Automotive Die Work. Paul Burt. *Western Machinery and Steel World,* v. 40, Nov. 1949, p. 94.

Adjusting sleeves and locking clamps for Ford steering assemblies are produced in progressive dies.

19B-226. New Rod Mill at Minnequa Works of the Colorado Fuel and Iron Corporation Ready for Operation. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1319-1326, 1334.

Includes layout diagram.

19B-227. Steel Strip Extension Gauge. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2348.

New electronic instrument for measurement of small reductions during rolling. Operation is based on variation in magnetic pattern.

19B-228. Flame Straightening, Forming and Cleaning Structural Steel. F. H. Dill. *Welding Journal,* v. 28, Nov. 1949, p. 1067-1069.

Uses of the oxy-acetylene flame.

19B-229. Presses Produce a Variety of Parts for Many Ships at Puget Sound Navy Shipyard. Howard E. Jackson. *Modern Industrial Press,* v. 11, Nov. 1949, p. 38, 40, 42, 44.

19B-230. New Techniques at Ford's Forge Plant. Joseph Geschelin. *Automotive Industries,* v. 101, Dec. 1, 1949, p. 38-39, 62, 64.

Extrusion forging of front spindles, automatic salt-bath transformation annealing of certain parts, and other significant operations.

19B-231. Heavy Forgings for Shipbuilding. R. C. Benson. *Steel Processing,* v. 35, Nov. 1949, p. 583-589.

Methods for production, including manufacturing limitations, types of forgings, and forgings requiring bending operations after forging.

19B-232. Open-Top Can Manufacture. Frank H. Slade. *Machinery* (London), v. 75, Nov. 17, 1949, p. 712-715.

Layout of can-making line. Slitting, rolling, knurling, pressing, forming, soldering, flanging, seaming, testing, etc.

19B-233. Die Phosphatierung als Hilfsmittel bei der spanlosen Formung von Eisen und Stahl. (Phosphating as an Aid to the Noncutting Working of Iron and Steel.) Alfred Durer. *Archiv für das Eisenhüttenwesen,* v. 20, Sept.-Oct. 1949, p. 305-312.

Reviews literature and shows the numerous advantages of a zinc phosphate coat on iron and steel as an aid to the cold working of these metals. Proposed method reduces not only the internal stresses of the metal, but also prolongs the life of the die. 28 ref.

19B-234. Club Sandwich With Chopped Onion? *Mainspring,* v. 13, Dec. 1949, p. 1-4.

A popular exposition of the structural transformations occurring in drawing and patenting spring-steel wire. The title is explained on the basis of the statement that "the carbon in spring steel forms an iron carbide which, in small plates, teams up with plates of pure iron like a club sandwich, a number of which lie in the matrix of iron like the onions in the stew."

19B-235. Blooming Mill Operations at Keystone Steel & Wire. William Herman. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 88-91; discussion, p. 91.

The basic principle involved, which differs from the conventional practice, lies in the fact that ingots are rolled directly to small billets in one and the same pair of rolls.

19B-236. C. F. & I. Rod Mill Speeds Production. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 108-112.

Layout and equipment.

19C—Nonferrous

19C-1. Precision Dies Draw Brass Lock Parts. Harold E. Nagle. *American Machinist,* v. 92, Dec. 30, 1948, p. 74-77.

19C-2. Manufacturing Gun-Shot From Wire; A New Italian Process. *Wire Industry,* v. 15, Dec. 1948, p. 809.

Advantages over the shot-tower method. The new machine, using wire obtained from lead bars or scrap, produces in large quantities, at high speed, and without waste, any size of shot, exactly spherical in shape and with perfect polish and consistent hardness. Also permits the use of special alloys of lead.

19C-3. The Flow of Metal in Tube Extrusion. C. Blazey, L. Broad, W. S. Gummer, and D. B. Thompson. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 163-184.

Experiments by means of composite billets. The principal factor determining the type of flow is the degree to which the skin of the billet remains in place. In a non-lubricated container, there is sufficient friction between brass and Cu-Ni billets and the container wall to hold the skin in place, but with Cu the oxide envelope formed in preheating appears to function as a

lubricant. In a lubricated container, brass and Cu-Ni flow like copper.

19C-4. Modern Methods and Techniques Are Employed in Brass Rod Fabrication. *Copper & Brass Bulletin,* Feb. 1949, p. 2-5.

Production by the hot extrusion process.

19C-5. New Beryllium Copper Molds. Frank Charity. *Modern Machine Shop,* v. 21, Feb. 1949, p. 174, 176, 178, 180.

Molding process which features the combined use of hobbing, casting, and press-forging operations.

19C-6. A Thermoelectric Study of the Cold-Rolling and Heat-Treatment of Copper. G. W. Brindley. "Report of a Conference on Strength of Solids," *The Physical Society,* 1948, p. 95-104; discussion, p. 105-106.

Data for the thermal emf. of cold rolled and heat treated copper strips relative to a standard annealed strip for a wide range of rolling reductions and annealing temperatures. Relations between emf., time, and temperature are derived on the respective suppositions that softening of cold worked metal proceeds according to single-stage or double-stage processes.

19C-7. The Disordering of β Brass by Cold Work. R. W. K. Honeycombe and W. Boas. *Australian Journal of Scientific Research,* ser. A, v. 1, June 1948, p. 190-196.

Electrical resistivities of an α-β brass, some α brasses of various zinc contents, and an aluminum bronze were measured after various deformations by wire drawing. Resistivity of the duplex alloy increases steeply after about 80% reduction in area, which increase is shown to be due to the resistivity change of the β phase.

19C-8. New, Stronger, Cylindrical Forms Produced by 4,000-Ton Squeeze. *Mechanical Topics,* v. 2, No. 2, (1948), p. 4-5.

Extrusion press which makes tubes of Monel, nickel, and Inconel in o.d.'s up to 9¼ in. and lengths up to 12 ft.

19C-9. Brass Rods. U. M. Evans. *Iron Age,* v. 163, Apr. 14, 1949, p. 66-69.

Drawing, straightening, cutting to length, and polishing of the above. Capable of handling rounds in sizes from ⅜ to 1 in. and square and hexagon stock in sizes from ⅜ to ⅞ in., this unit produces finished stock at a rate approximately double that of conventional draw benches and triple that of other types of continuous drawbenches.

19C-10. Rod Finishing; The "Lomatic" Combined Drawing, Cutting and Straightening Machine. John Rae, Jr., and Leslie Miller. *Metal Industry,* v. 74, Mar. 25, 1949, p. 229-232.

Machine for producing round, square, and hexagon-shaped brass rods.

19C-11. Development of the Zone of Plastic Deformation and Cold Hardening During Deformation of Metal in the Presence of Surface-Active Substances. (In Russian.) T. Yu. Lubimova, P. A. Rebinder, and L. A. Shreiner. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 21, 1948, p. 293-295.

Investigated on polycrystalline zinc and copper using a specially developed test apparatus. A 0.1% solution of stearic acid in kerosene and a 0.2% solution of oleic acid in vaseline oil were used as surface-active media. Surface hardness of cold worked zinc increases 1.5 times as much as that of copper without agents and two times when such agents are used. Causes of the phenomenon. Influence of other factors, such as time and temperature.

19C-12. Influence of Mechanical Deformation on the Variation of Electrical Resistance in a Longitudinal Magnetic Field (Thompson's Galvano-Magnetic Effect) in Ni_3Mn Alloy. (In Russian.) R. G. Annaev. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 64, Jan. 1, 1949, p. 45-47.

Thompson's galvano-magnetic effect was investigated from the point of view of its dependence on elastic and plastic deformation in the range from weak field to saturation state. 12 ref.

19C-13. Continuous Lead-Extrusion Machine for Electric Cables. *Engineering,* v. 167, Apr. 8, 1949, p. 319-321, 324.

Above equipment made by a British firm.

19C-14. An Engineering, Metallurgical and Cost-Price Guide for Brass and Bronze Forgings. H. C. Ward. *Iron Age,* v. 163, May 12, 1949, p. 78-82.

Cu-base parts requiring a dense, uniform structure and a high-grade surface finish can often be produced economically by forging. Inherent advantages of forgings, engineering and metallurgical factors involved, and a general cost guide applicable to the average forged part.

19C-15. A Century of Progress: Activities of the Birmingham Battery and Metal Co., Ltd. D. W. D. Showell. *Metal Industry,* v. 74, May 27, 1949 p. 419-422.

Manufacture of Cu-base tubes,

sheets, plates, rods, and wire. Refining, casting, hot and cold rolling, rotary piercing, extrusion, reducing, and tube drawing, the wire mill, and the laboratories.

19C-16. Stove Elements From Strip. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 14-15, 32, 35.

Production of electric-range elements from Inconel by Moffats, Ltd., a Canadian range manufacturer. Press operations and welding.

19C-17. Triple-Draw Push-Pointing Drawbench for Tubes. *Engineering,* v. 167, June 3, 1949, p. 512-513, 516. A Triple Drawbench. *Engineer,* v. 187, June 3, 1949, p. 610-613.

Believed to be the first of its kind; installed recently by a British firm for the production of brass and copper tubes.

19C-18. For Speed and Economy in Tube Drawing. *Light Metals,* v. 12, July 1949, p. 396-401.

First fully automatic, push-pointing, triple-draw, tube-drawing machine for production of brass and copper tubes.

19C-19. Wire Drawing of Some Non-Ferrous Metals. E. L. H. Bastian. *Wire and Wire Products,* v. 24, July 1949, p. 588-592, 626-629.

Various methods with emphasis on lubricants used for the different metals and methods.

19C-20. Rod and Section Extrusion; The Holford Works of I. C. I. Ltd., (Metals Division). *Metal Industry,* v. 75, July 22, 1949, p. 63-67.

Procedures and equipment of above plant, products of which are copper-base extrusions.

19C-21. Westinghouse Copper Wire Mill at Buffalo, N. Y. Part I. *Wire and Wire Products,* v. 24, Aug. 1949, p. 686-689, 705-706.

Operations and methods in copper-wire production and insulated wire and cable manufacture. Annealing and insulation.

19C-22. Wire Manufacture; The Elliott Works of I.C.I. Ltd. (Metals Division). *Metal Industry,* v. 75, Aug. 5, 1949, p. 103-106.

Equipment and procedures for production of copper and copper alloy wire.

19C-23. Die Walztextur von Zink und Zinklegierungen und ihr Einfluss auf die technologischen Eigenschaften, insbesondere die Tiefziehfähigkeit. (The Texture of Rolled Zinc and Zinc Alloys and Its Effect on Industrially Important Properties, Especially Deep Drawing Properties.) Wilhelm Hofmann and Bernhard Trautmann. *Zeitschrift für Metallkunde,* v. 39, Oct. 1948, p. 293-303.

Grain structures were determined by an X-ray method. Mechanical properties of sheets rolled by different methods were also determined. Results show that the method of rolling considerably affects the texture of a metal and, consequently, its mechanical properties. 19 ref.

19C-24. Small Tubes. Charles T. Flachbarth and Chester S. Pondo. *Metal Progress,* v. 56, Oct. 1949, p. 499-500.

Case history of the application of improved metallurgical engineering methods, processes, tooling and material utilization to achieve production economy and an improved product in the cold drawing of seamless brass tubing.

19C-25. Selection Chart for Deep-Drawing Dies. *American Machinist,* v. 93, Oct. 20, 1949, p. 121, 123.

Use of chart by which the die designer can lay out a series of drawing dies so the appropriate reduction in area per draw is achieved for material involved, type of operation, and required properties of the shell. It is applicable to 66-34, 70-30, 85-15, and 80-20 brasses, and to silicon bronze.

19C-26. L'Emboutissage des alliages de Cuivre; Das Tiefziehen von Kupferlegierungen. (Deep Drawing of Copper Alloys.) George Sachs. *Pro-Metal,* v. 2, Oct. 1949, p. 475-490.

Methods and processes, machines, dies, materials, and lubricants.

19D—Light Metals

19D-1. A Review of Spinning Light Metals. Benjamin Melnitsky. *Light Metal Age,* v. 6, Dec. 1948, p. 8-11.

19D-2. Production of an Aluminum Cabinet. G. W. Birdsall. *Light Metal Age,* v. 6, Dec. 1948, p. 20-21.

Forming operations.

19D-3. Presses at Benson Plant Set Pace for 1,000 Barrel-a-Day Output. P. D. Aird. *Modern Industrial Press,* v. 10, Dec. 1948, p. 13-14, 16.

Production of aluminum barrels. Includes welding and inspection procedures.

19D-4. Canada's New Aluminum Sheet and Foil Mill. *Modern Metals,* v. 4, Dec. 1948, p. 29-31.

Various operations in producing sheet and foil from billet rolling to packaging.

19D-5. Spinning Large Aluminum Air Diffuser Cones. *Machinery* (American), v. 55, Jan. 1949, p. 168-169.

A picture story.

19D-6. Analyzing the Effects of

Stretch-Wrap Forming of Sheet-Metal Parts. W. T. Kluge. *Machinery* (American), v. 55, Jan. 1949, p. 184-187.

System developed for charting the amount and location of elongation that occurs in stretch-wrap forming of sheet aluminum. Data can be used in determining the exact pressure required for subsequent work.

19D-7. Uber den Einfluss einer Kaltverformung auf die Ruckbildung der Kaltaushärtung von Duralumin. (The Effect of Cold-Working on the Reappearance of Room-Temperature Age Hardening of Duralumin.) Karl-Ludwig Dreyer. *Metallforschung,* v. 2, Dec. 1947, p. 362-364.

Experimental data in which the aging process was extended to 5 years.

19D-8. Erholung, Ruckbildung und Nachhärtung bei Verfestigung durch Kaltaushärtung und Kaltbearbeitung von Aluminiumlegierungen. (Recovery, Reduction, and Improvement of the Physical Properties of Aluminum Alloys by Room-Temperature Age Hardening and Cold Working.) Friedrich-Carl Althof. *Metallforschung,* v. 2, Dec. 1947, p. 365-383.

Effects of cold and hot working on the age hardening of different types of Al-Cu-Mg and Al-Zn-Mg alloys were investigated. Working may be followed by a decrease in strength even at room temperature. Kästner's and Kostron's correlation between room-temperature age hardening and cold working could not be verified. 17 ref.

19D-9. Disegno e utilizzazione dei profilati estrusi. (Designing and Utilization of Extruded Structural Parts.) *Alluminio,* v. 17, Sept.-Oct. 1948, p. 461-491.

Confined to aluminum and its alloys.

19D-10. Aluminum Alloy Shearing Performed at Line Speed of 300 Feet per Minute. *Steel,* v. 124, Jan. 24, 1949, p. 64.

Use of Talbot type flying sheet shear at Youngstown plant of United Engineering and Foundry Co.

19D-11. "One-Piece Aluminum Boat"—Mass Produced by Reynolds Metals Company. P. D. Aird. *Modern Industrial Press,* v. 11, Jan. 1949, p. 13-14, 18, 36.

Press, welding, and assembly operations.

19D-12. Press Users Conquer Fabrication Problems in Making New Magnesium Products. Floyd McKnight. *Modern Industrial Press,* v. 11, Jan. 1949, p. 22, 24, 26.

Miscellaneous press operations.

19D-13. Continuous, Quantity Production of Aluminum Luggage. Fred M. Burt. *Modern Industrial Press,* v. 11, Jan. 1949, p. 38, 40, 42, 46.

Press operations, heat treating, machining, finishing, and assembly.

19D-14. Permanente Continues Northwest Growth. *Western Metals,* v. 7, Jan. 1949, p. 25-26.

Procedures and equipment of Permanente's aluminum sheet mill at Trentwood, Wash.

19D-15. The Alloys Appropriate to Wire Manufacture. D. C. G. Lees. *Wire Industry,* v. 16, Jan. 1949, p. 45-47; discussion, p. 47.

Aluminum alloys suitable for the above.

19D-16. General Notes on Aluminum Presswork. X. J. W. Lengbridge. *Tool Engineer,* v. 22, Feb. 1949, p. 34-37.

Drawing speeds, lubrication, and methods of calculation of blank size for different shaped shells.

19D-17. Stretch-Wrap Forming; Exploring the Possibilities of the New Hufford A. 50 Machine. *Aircraft Production,* v. 11, Feb. 1949, p. 62-64.

Equipment and some results obtained.

19D-18. Manufacturing Aluminum Luggage. Fred M. Burt. *Light Metal Age,* v. 7, Feb. 1949, p. 8-9, 22.

Press operations, heat treating, and finishing.

19D-19. Easy to Deep Draw Aluminum. W. E. Hoge. *American Machinist,* v. 93, Feb. 24, 1949, p. 105-108.

Deep drawing of washing-machine tubs at rates of more than 100 per hour from annealed 3S Al.

19D-20. The Distribution of Residual Stresses in the Rolling Process. Chih-Chun Hsiao. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, No. 2, 1948, p. 141-149.

Experiments on residual-stress distributions in flat cold rolled aluminum plate. Quantitative residual stresses indicate that alternate passes in different directions, at the same percentage thickness reduction per pass, produce very little difference in residual stress distribution from the case of alternate passes in the same direction.

19D-21. Triple Surface Protection for Drawing and Ironing Aluminum. E. V. Crane, S. Battaglia, and H. Rottersman. *Iron Age,* v. 163, Mar. 10, 1949, p. 106-108.

Chemical, plastic, and extreme-pressure-lubricant treatments of aluminum developed for severe drawing and ironing conditions. Preparatory treatment as well as method of

application of the three treatments, all of which are used simultaneously.

19D-22. Deep-Drawing One-Piece Aluminium Boat Hulls. *Machinery* (London), v. 74, Feb. 17, 1949, p. 203-204.

As done by Reynolds Metals Co., Louisville, Ky.

19D-23. How to Rubber-Form Light Metals. R. Burt Schulze. *American Machinist,* v. 93, Mar. 10, 1949, p. 101-116.

Parts of a book which deal with rubber-pad forming.

19D-24. The Relief of Internal Stresses in Aluminum Alloys by Cold Working. W. Betteridge. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 171-177; discussion, p. 398-431.

Effect of cold working on internal stresses in heat treated Al alloy samples. Considerable reduction of the stresses can be effected by cold working, and this is best applied between solution treatment and aging. The application of the process to an airplane engine impeller stamping.

19D-25. Supplementary Press Forming Operations. XI. J. W. Lengbridge. *Tool Engineer,* v. 22, Mar. 1949, p. 37-40.

Continues series on theory and practice of pressing aluminum. Operations such as expanding, contracting, flanging, and beading necessary to complete the forming of the shell, and in the shaping of hollow vessels. (To be continued.)

19D-26. Impact Extruding Aluminum. *Steel,* v. 124, Mar. 28, 1949, p. 72-76.

Opportunities for reducing costs and improving product design. Outlines five major steps in impact extrusion process.

19D-27. Design for Forging; Application to High Strength Aluminium Alloys. *Metallurgia,* v. 39, Feb. 1949, p. 191-194. Reprinted from *Hawker Siddeley Review,* Aug. 1948.

Forging process; design, production, and mechanical properties of forgings; close-to-form stampings.

19D-28. Impact Extrusion of Aluminum. John L. Everhart. *Modern Metals,* v. 5, Mar. 1949, p. 23-25.

See abstract from *American Machinist,* item 19d-62, 1948.

19D-29. Uber die Verformung des Magnesiums und seiner Legierungen. (On the Deformation of Magnesium and Its Alloys.) Theodor Ernst and Fritz Laves. *Zeitschrift fur Metallkunde,* v. 40, Jan. 1949, p. 1-12.

Effects of forging and rolling on structures. Resulting deformations were examined metallographically with special etchants. Results indicate the possibility of "fracture slippage", a combination of fracture and translation phenomena.

19D-30. Three-Dimensional Routing. *Aircraft Production,* v. 11, Apr. 1949; p. 111-114.

Routing was adopted in air-frame manufacture as a rapid means of shaping light-alloy sheet-metal parts without expensive press tools, which the quantities required would not justify. In the normal routing process, the material is removed by the side or periphery of the routing tool. Describes an "end" routing process (cutting with the end of the routing tool in the manner of an end-mill) which process has been adapted to the trimming of single or double curvatures requiring the cutter to follow a three-dimensional path. Equipment modifications, procedures, and applications.

19D-31. Punch Press Tools for Cutting. J. W. Lengbridge. *Tool Engineer,* v. 22, Apr. 1949, p. 37-40.

Installment No. 12 of a series on the theory and practice of pressing aluminum. Fundamentals of press cutting, clearance and controlling factors, and effect of clearance on size. Specific data on clearance for aluminum, and approximate data on copper, brass, and steel.

19D-32. Designing of "Trouble-Free" Dies. Part XCII. Suitable Presses for Drawing Sheet Aluminum. C. W. Hinman. *Modern Industrial Press,* v. 11, Apr. 1949, p. 24, 48.

19D-33. Aluminum Wire. *Light Metals,* v. 12, Apr. 1949, p. 203-215.

Concludes report of conference on Al-wire manufacture. Papers condensed in this installment deal with heat-treatment practice (D. C. G. Lees); with wire-drawing machines; and with wire-drawing dies (both by N. Davidson).

19D-34. Blockaufnehmer (Rezipienten) von Strangpressen fur Leichtmetalle. (Chambers for Light-Metal Extrusion Presses.) F. Nawroth. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 23-27.

Materials and design, and systems of heating the chambers to any desired temperature. Properties of different metals and alloys.

19D-35. Apparition de cornes dans l'emboutissage de l'aluminium et de ses alliages. ("Ear" Formation in Deep-Drawing Operations on Aluminum and Its Alloys.) Raymond Chevigny. *Revue de l'Aluminium,* v. 26, Mar. 1949, p. 79-87.

Ears are troublesome deformations of the external edges of pressed or spun parts; they are

caused by anisotropy of the mechanical properties of the metal in relation to the direction of rolling. With Al and its alloys four different types of deformation occur. Effects of impurities and methods of minimizing ear formation by proper rolling and annealing schedules.

19D-36. Aluminum Wire. Section III. Wiredrawing Machines; Wiredrawing Dies. N. Davidson. **Lubrication in Aluminium Wiredrawing.** A. L. H. Perry. *Wire and Wire Products,* v. 24, May 1949, p. 418-423, 446; discussion, p. 421, 446-448.

Section three of a series of lectures.

19D-37. Drawing and Spinning of Aluminum Alloys. *Machinery,* v. 55, May 1949, p. 170-176. Condensed from paper by E. G. Kort.

The preliminary annealing operation, giving recommendations for the various alloys; equipment and design of tools for drawing; equipment for spinning; and lubricants for drawing and spinning.

19D-38. Cutting Loads in Punch Press Tools. XIII. J. W. Lengbridge. *Tool Engineer,* v. 22, May 1949, p. 37-42.

Theory and practice of pressing aluminum, including tool penetration and shear, and the shaving (smoothing) of a pre-cut edge by removal of a small amount of metal. Experimental results obtained in a study of the mechanism of die cutting of Al under different conditions of clearances. Alloys tested were Alcan 2S-O, 2S-H, and 17S-T. Drawing lubricants, including lubrication of lithographed stock. (To be concluded.)

19D-39. Hot Dimpling Magnesium Sheet. H. R. Carns. *Automotive Industries,* v. 100, May 15, 1949, p. 42-43, 98, 100, 102.

Compares the direct-resistance and the conduction method. Latter is more satisfactory for production work.

19D-40. Duralumin Extrusion and Rolling. D. H. H. Clarke. *Metal Industry,* v. 74, May 20, 1949, p. 399-402.

Practice at one company.

19D-41. Types and Functions of Press Tools. 14. J. W. Lengbridge. *Tool Engineer,* v. 22, June 1949, p. 36-40.

Functions of four general types of press cutting tools: simple, multiple, progressive, and compound. Choice of tool and elements of design. (To be concluded.)

19D-42. Uber die Herstellung spannungskorrosionsbeständiger Werkstucke aus Al-Mg-Legierungen. (The Production of Stress-Corrosion-Resistant Parts From Al-Mg Alloys.) E. Mohr. *Archiv fur Metallkunde,* v. 3, Mar. 1949, p. 117-118.

Various heterogenization processes for Al-Mg alloys, especially the Siebel-Vosskuhler process; and difficulties of industrial heterogenization of the alloys containing about 6-7% Mg. Experiments made to meet these difficulties. A photomicrograph shows structures of an Al-Mg alloy in the rolled and in the annealed semi-hard state. Tensile-test data.

19D-43. Aluminum Foil Operations at Permanente Metals Corp. *Light Metal Age,* v. 7, June 1949, p. 10-11, 23.

Involves primarily cold rolling, annealing, and laminating.

19D-44. Dies Make That Bulge in Cooker Pots. B. E. Schroeder. *American Machinist,* v. 93, June 30, 1949, p. 96-99.

How bulged sidewall of Hotpoint deep-well cooker shell is formed hydraulically with 2000-psi. pressure from intensifier in press base from 3S-O Al-alloy disks.

19D-45. Hot Forming Tests With Magnesium. Gilbert C. Close. *Modern Machine Shop,* v. 22, July 1949, p. 98-102, 104, 106.

Tests dealing with drop hammer and stretch press forming of hot magnesium sheet stock. Wider application of formed Mg parts is predicted as a result of the tests.

19D-46. Extrusion at Redditch. *Light Metals,* v. 12, July 1949, p. 382-387.

Extrusion process for the manufacture of light-alloy sections.

19D-47. Metal Requirements for Aluminum Presswork. J. W. Lengbridge. *Tool Engineer,* v. 23, July 1949, p. 40-45.

Concluding installment of a series on the theory and practice of pressing aluminum. Other sections are: metal requirements, selection of alloys, metal defects, and product defects.

19D-48. German-Built Aluminum Mill Produces for Permanente. James Joseph. *Western Metals,* v. 7, July 1949, p. 19-21.

Use of foil mill shipped from Germany, re-erected and modified.

19D-49. Aluminium Alloy Forgings; A Decade of Progress. C. Wilson and J. W. Munday. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 83-89.

Present status and future trends. Heat treatment.

19D-50. Multicellular Forms. *Aircraft Production,* v. 11, Aug. 1949, p. 262-263.

Forming of multicellular structural sheet metal units on the drop

hammer from various Al alloys. These units are designed to replace composite riveted assemblies made from sheet reinforced by channels, stiffeners, and gussets.

19D-51. Giant Press Equipment Helps Produce Aluminum Stock at Permanente Metals Corporation. Howard E. Jackson. *Modern Industrial Press,* v. 11, Aug. 1949, p. 30, 34, 36.

19D-52. Stretch-Wrap Forming. W. T. Kluge. *Light Metal Age,* v. 7, Aug. 1949, p. 10-13, 25.

Hufford machine which replaces the drop hammer and other stretching and forming machines in the North American Aviation plant. Al sheet is pre-stretched before the wrapping action takes place, providing a more uniform thickness and strength with minimum "springback". Forming data and physical properties. Includes an outline of experimental stretch forming of magnesium-alloy sheet at Texas Engineering and Mfg. Co., using similar equipment.

19D-53. New Method Eliminates Handwork on Aluminum Aircraft Ducting; Saves Five Minutes Per Section. *Light Metal Age,* v. 7, Aug. 1949, p. 17.

Advanced power-brake technique.

19D-54. Stretch-Forms Magnesium in Experimental Aircraft Manufacture. *Steel,* v. 125, Sept. 12, 1949, p. 122.

Stretch-forming of Mg alloy canopy frames for prototype models of the TE-1A military-type trainer.

19D-55. Surface Orientation and Rolling of Magnesium Sheet. Robert L. Dietrich. *Journal of Metals* (Technical Section), v. 1, Sept. 1949 (*Metals Transactions,* v. 185), p. 621-626.

A study of orientation, either during the rolling process or by treatment of the finished sheet, was made in an effort to improve bend properties and toughness. Surface orientation of AZ31X sheet can be improved by higher temperature, higher reduction per pass, and adequate lubrication during hot rolling with resultant improvement in bend properties and compression yield strength. The improved orientation persists to a remarkable degree through subsequent annealing and cold rolling operations. X-ray reflection patterns illustrate results. 17 ref.

19D-56. Densified Wood Dies Facilitate Forming of Aluminum. James Milliken. *Machinery* (American), v. 56, Sept. 1949, p. 178-181.

Use for deep drawing and bending of Al, resulting in a more even distribution of metal and better surface finish.

19D-57. Dies for Home Freezer-Lid Panels. Edward N. Sorensen. *Tool Engineer,* v. 23, Sept. 1949, p. 26-27.

Production sequence using 20-gage cold rolled, deep draw stock. Operations are: shear stock to size; draw; trim and pierce; redraw and restrike; cam pierce nine holes; and cam flange.

19D-58. The Production of Light Alloy Forgings and Stampings. *Machinery,* v. 75, Sept. 15, 1949, p. 367-372.

Methods employed by British firm.

19D-59. Cold Rolling. Developments in Modern Mill Design. L. R. Underwood. *Metal Industry,* v. 75, Sept. 16, 1949, p. 231-233; Sept. 23, 1949, p. 243-245, 249; Sept. 30, 1949, p. 270-273.

Mills used in the light-alloy industry. Design of electrical strip-tensioning equipment. Final installment gives special attention to the Sendzimir mill, the "Y" mill, and the Steckel mill.

19D-60. Forging Aluminum and Magnesium. G. D. Welty. *Machinery,* v. 56, Oct. 1949, p. 143-149.

Equipment, procedures, and typical applications. Heat treatment, cleaning, and inspection.

19D-61. Sheet and Strip Rolling at Oldbury. *Light Metals,* v. 12 Oct. 1949, p. 560-563.

Some of the operations involved in production of pure Al and Al alloy sheet and strip.

19D-62. The New Factory of the Société Centrale Des Alliages Légers at Issoire (Puy-De-Dôme) for the Working of Light Alloys. Jean Matter and Marcel Lamourdedieu. *Journal of the Institute of Metals,* v. 75, Aug. 1949, p. 899-920.

19D-63. Some Technical Problems Influencing Production Economy in the Rolling of Aluminium. W. J. Thomas and W. A. Fowler. *Journal of the Institute of Metals,* v. 75, Aug 1949, p. 921-948.

Present difficulties, possible causes, and suggested remedies. Casting large slabs by a semi-continuous method and defects encountered; hot rolling of Al alloys; cooling and lubrication of the rolls; coolant properties; production of intermediate-temper rolled metal by thermal treatment rather than cold working; means of producing fine-grained metal; and continuous heat treatment of sheet before cutting the coils to desired lengths.

19D-64. Forging and Stamping Light Alloys. The Issoire Works of the Société Forgeal. R. Colomb. *Metal Industry,* v. 75, Oct. 14, 1949, p. 333-335.

Equipment, procedures. Tables show compositions of alloys used,

minimum guaranteed mechanical properties, and heat treatment schedules.

19D-65. Aluminum Wire. *Light Metal Age*, v. 7, Oct. 1949, p. 12-13.

Procedures and equipment for production at Permanente Metal Corp.'s new plant in Newark, Ohio.

19D-66. Hydraulic Press Technique. *Light Metal Age*, v. 7, Oct. 1949, p. 13.

Procedures and equipment used in forming of aluminum cooker shells with bulged side sections for electric ranges.

19D-67. Étude des criques apparaissant au cours du laminage des billettes d'Aluminium 99.5 coulées. (Investigation of Cracks Appearing During Rolling of Cast 99.5% Aluminum Billets.) H. Jolivet and M. Armand. *Revue de Métallurgie*, v. 46, July 1949, p. 421-438; discussion, Aug. 1949, p. 567-568.

Macroscopic cracks formed during rolling are believed to begin with microscopic cracks present in the casting. Importance of Si-Fe ratio and of the presence of gaseous and oxide inclusions. Practical methods for minimizing crack formation. 30 ref.

19D-68. How To Form and Join Magnesium Sheets. C. L. Hibert. *Machinery* (American), v. 56, Dec. 1949, p. 139-145.

Recommended procedures on the basis of experiences restricted to one alloy—Dow FS-1h. Protective treatments and pickling baths.

19D-69. Simple Tooling; Small-Scale Production of a Difficult Fuselage-Member. L. G. Burnard. *Aircraft Production*, v. 11, Dec. 1949, p. 393-395.

Use of rubber-die press forming by a British firm. Machining operations.

SECTION XX

MACHINING and MACHINABILITY

20A—General

20A-1. Truing Form Grinding Wheels. Jack T. Welch. *Iron Age,* v. 162, Dec. 16, 1948, p. 95-98.

Use of wheel-truing rolls, their accuracy, construction, and sizing.

20A-2. Portable Jig Borer Cuts Costs. *Iron Age,* v. 162, Dec. 16, 1948, p. 102.

Tool designed to expedite precision work on airplane forgings or castings.

20A-3. Producing Multiple Parts Per Cam Cycle. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 22-24.

Methods using the Browne & Sharpe automatic.

20A-4. Trepan Tools Perform Difficult Machining Operations. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 26-29.

Setups employed for screw-machine production of complex part. Problems involved include: the irregular form on the inside face of the part; turning a stem extending from within the center of the part; machining an undercut on the inner boss—actually extending the stem below the face of the boss; and forming a radius on the back face of the part.

20A-5. Pitfalls to Avoid in Tooling Screw Machines. Part Eight. Noel Brindle. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 31-34.

Two examples are: a caution against using the swing stop with small-diameter rod; and a discussion of the advantages of using the long-turret change shaft.

20A-6. The History and Development of the Swiss Type Automatic. *Screw Machine Engineering,* v. 10, Dec. 1948, p. 36-37.

20A-7. Practical Ideas. *American Machinist,* v. 92, Dec. 30, 1948, p. 115-116.

Includes the following: shift bar controls action of floating punches (Lowell F. Stull); reversed shaper tool doesn't dig in (S. B. Richey); special gage for measuring inside of recess (John T. Holmquist); and other miscellaneous shop hints.

20A-8. Contour Machining. H. J. Chamberland. *Science & Engineering,* v. 1, Sept. 1948, p. 48-53.

Advantages and applications.

20A-9. Fir-Tree Broaching. *Aircraft Production,* v. 10, Dec. 1948, p. 423-427.

British equipment and procedures for simultaneous machining of blade-roots and rotor disks for turbines and axial-flow compressors.

20A-10. Pryor Marking Devices for Machine Tool Components. *Machinery* (London), v. 73, Dec. 2, 1948, p. 769-772.

Hardened toolsteel relief marking dies, and methods for their use.

20A-11. An Adjustable Fly-Cutter. *Machinery* (London), v. 73, Dec. 2, 1948, p. 772.

Existing types of adjustable fly-cutters must be used with care, since the projecting tool or cutter bar is a source of danger to the operator. The design diagrammed is simple and easy to make, eliminates this danger, and permits quick and positive setting.

20A-12. End-Form Grinding Machine; An Interesting Variation of the Centreless Principle. *Machinery* (London), v. 73, Dec. 9, 1948, p. 803-804.

Machine applicable to components which require profile grinding on the ends to forms which cannot be obtained on normal centerless grinding machines, on account of wheel wear and breakdown, or the difficulty of truing attachment.

20A-13. Air-Operated Milling Fixture for Machining Parallel Surfaces. *Machinery* (London), v. 73, Dec. 9, 1948, p. 804.

20A-14. Drilling of Compound Angles. *Tool Engineer,* v. 22, Jan. 1949, p. 20.

Diagrams and calculations.

20A-15. Tools for Milling Operations. A. E. Rylander. *Tool Engineer,* v. 22, Jan. 1949, p. 37-38.

Installment No. 6 of a series de-

scribes and diagrams the above and their methods of use.

20A-16. Cutting Fluid Application Chart. *Tool Engineer,* v. 22, Jan. 1949, p. 42-43.

Five charts permit determination of proper cutting fluid on the basis of metal, cutting speed and depth, and type of operation.

20A-17. Proceedings of Leningrad Conference on Methods for Rapid Cutting of Metals. (In Russian.) A. P. Sokolovskii and V. A. Blyumberg. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 1-12.

Conference dealt with methods used in the U.S.S.R. and abroad.

20A-18. The Physical Meaning of Specific Cutting Pressure. (In Russian.) E. N. Maslov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 12-15.

Analyzes the above concept, and its importance as a factor in determining the laws governing the prooess of machining.

20A-19. Concerning the Inspection of Metal Cutting Tools on the Basis of Cleanliness of Their Working Surfaces. (In Russian.) D G. Beletskii *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 18-22.

The influence of the tool finish on the microgeometry of the working surfaces was investigated and standards set up for their inspection.

20A-20. Vibration of Grinding Machine Tools. (In Russian.) N. V. Kolesnik. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 22-24.

A newly developed apparatus determines the time when the grinding wheels have to be readjusted and balanced.

20A-21. The Accuracy of Gear Hobbing Machine Tables. J. M. Newton. *Machinery* (London), v. 73, Dec. 16, 1948, p. 828-831. A condensation.

Experimental work on gear hobbers having 8 and 5-ft. diameter tables.

20A-22. A Recent Development in Automatic Lathe Control. E. P. Bullard, III. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 47-A-131, 1947, 11 pages.

Three-spindle automatic lathe with "Man-Au-Trol" attachment is capable of performing turning operations in a manner similar to that of a conventional engine lathe, but with the advantage that three parts are done simultaneously and the operation is entirely automatic.

20A-23. On the Shape of Backed-Off Milling Cutters. A. Michels, S. R. DeGroot, and C. A. Ten Seldam, *Applied Scientific Research,* v. Al, No. 3, 1948, p. 219-224.

A theoretical, mathematical analysis. When the back-off curve is given, one of the three shapes of profile, wanted profile, and shaving surface can be found, provided the other two are known. A formula is derived for the case where two of the three figures are either straight or plane and the back-off curve is a logarithmic or an Archimedic spiral.

20A-24. Modern Cutting Tools and Machine Tool Design. C. Eatough. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 336-342; discussion, p. 343-351.

Cost of production is determined to a great extent by the rate of feed. Changes in machine design brought about by introduction of carbide tools and limitations of these tools. Tool life is largely determined by cratering, hence rate of crater growth is dealt with at varying speeds and feeds. Reasons for the effectiveness of the grooved type of turning tool which encourages the formation of corkscrew-type chips.

20A-25. Machining; Workpiece Handling. T. E. Lloyd. *Iron Age,* v. 163, Jan. 6, 1949, p. 206-215.

The time required for workpiece handling is said to be a bottleneck in the way of full exploitation of new cutting materials and new machine-tool designs. Attacks on this problem now underway and some of the more outstanding achievements in boosting output.

20A-26. How Should a Wheel be Dressed? *Machine and Tool Blue Book,* v. 45, Jan. 1949, p. 133-136, 138-140, 142, 144.

Recommended procedures for grinding wheels.

20A-27. Designing and Using Drill Jigs. C. W. Hinman. *Machine and Tool Blue Book,* v. 45, Jan. 1949, p. 148-156.

Designs for a box jig used for drilling and tapping simultaneously, methods of drilling steel angular sections, and the building of long, narrow box jigs.

20A-28. Computing Offset for Machining Rake Angle on Milling Cutters and Reamers. D. West. *Machinery* (American), v. 55, Jan. 1949, p. 174-175.

20A-29. Portable Jig Boring Tool Facilitates Work on Large Assemblies. *Machinery* (American), v. 55, Jan. 1949, p. 182-183.

Tool developed by Consolidated Vultee Aircraft Corp. is especially adapted for machining parts that

are too large to be handled on stationary boring machines, as well as for fittings already installed.

20A-30. Reversible Jig Foot for Drilling Straight and Angular Holes. *Machinery* (American), v. 55, Jan. 1949, p. 192.

20A-31. Tool Engineering Ideas. *Machinery* (American), v. 55, Jan. 1949, p. 195-198.

"Drilling Square Stock on an Automatic Screw Machine," F. J. Watral; "Punch and Die for Forming an Unusual Shaped Piece," Robert Mawson; and "Locating Scriber for Marking Center Lines on Opposite Sides of a Shaft," H. Moore.

20A-32. Automatic Cycling Permits Rapid Turning and Boring of Sleeve Bearings. Guy Hubbard. *Steel,* v. 124, Jan. 10, 1949, p. 63-64.

Arrangements for easy loading and unloading of work, and co-ordinated operations cut idle time to minimum and allow one operator to run two lathes.

20A-33. Guide Rails Speed Jig Alignment. Ben C. Brosheer. *American Machinist,* v. 93, Jan. 13, 1949, p. 94.

20A-34. Practical Application of Surface Finish. Georg Schlesinger. *American Machinist,* v. 93, Jan. 13, 1949, p. 101-110.

Results of shop experience with tracer-type, or stylus, instruments from 1939 to 1948. Tests were made to determine surface quality as the criterion for tool sharpness in diamond turning, precision boring, grinding, honing, lapping, and gear cutting. Examples of analyses of gear-tooth profiles produced by available processes, finishing of pistons and liners for air compressors, diamond boring a bushing, and turning railway wheels.

20A-35. Practical Ideas. *American Machinist,* v. 93, Jan. 13, 1949, p. 120-124.

Includes the following: special holder clamps small parts for buffing (John K. Lukacs); die ejects slugs without bolster hole (Roger Isetts); universal die sets reduce costs (Gerhard Wenke); method for chucking gear hubs with small i.d.'s (W. J. Blankenship); tailstock to center large pipes (Thomas Gray); micrometer height gage (R. Kaden); quick-acting clamp from which part clamped can be removed directly upward (H. Buckley); triple toolbits for rapid reduction of bar stock (D. Moore and C. Johnson); peening increases life of shell reamer (W. Brunner); multiple-spindle heads finish sewing-machine parts; drilling angle iron on tilted universal table (S. B. McKay); salt-bath heat treatment fixture for rod stock (M. Karge); and other miscellaneous shop hints.

20A-36. Production Data Sheet: General Grinding Practice for Milling Cutters. *Production Engineering & Management,* v. 23, Jan. 1949, p. 65.

Covers high speed steel, cast alloy, and tungsten carbide tipped blades.

20A-37. Advantages of Double Indexing an Eight-Spindle Chucking Automatic. *Screw Machine Engineering,* v. 10, Jan. 1949, p. 22-26.

Setup for producing a specific part.

20A-38. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Jan. 1949, p. 27-31.

The various types of turret lathes and their attachments. Applications and advantages of each.

20A-39. Tables of Corrected Diameters on 10° Top-Rake Circular Tools for No. 00G Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering,* v. 10, Jan. 1949, p. 32-34.

20A-40. Modern Machine and Engineered Tooling Produce Complex Part. *Screw Machine Engineering,* v. 10, Jan. 1949, p. 40-43.

Setups for production of bar-shaped part having cross-drilled holes, recesses, threaded end, and other complexities, on the multiple-spindle bar machine, in only 4.5 sec.

20A-41. Pitfalls to Avoid in Tooling Screw Machines. Part Nine. Noel Brindle. *Screw Machine Engineering,* v. 10, Jan. 1949, p. 49-54.

The first example is a recessing operation. The necessity for two throws and two feeds per revolution on drill lobes when the centering operation is omitted is explained. The second example, dealing with a part made from brass tubing, illustrates why it is sometimes advisable to "open up" the inside diameter with a drilling operation before reaming.

20A-42. (Book). **Drilling and Surfacing Practice. Ed. 3.** Fred H. Colvin and Frank A. Stanley. 523 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $5.00.

How to drill, ream, tap, plane, shape, slot, mill, and broach according to the most advanced methods. Revision incorporates all of the major developments that have taken place in this field since 1936. All information is given in a simple, clear-cut, easy-to-follow manner. (From review in *Steel.*)

20A-43. (Book). **Jigs and Fixtures.** Rev. Ed. F. H. Colvin and L. L. Haas. 410 pages. McGraw-Hill Book Co., 330 West 42nd St., New York 18. $4.50.

Practical aspects of design, construction and use of jigs and fixtures in machine shop practice are taken up by type of operation. Elements in jig and fixture design; standard parts for jigs and fixtures; welded cast iron and aluminum fixtures; various clamping and holding methods; inspection techniques.

20A-44. Adjustable Fixture Increases Utility of Special Purpose Machine. Thomas E. Lloyd. *Iron Age,* v. 163, Jan. 20, 1949, p. 61-65.

By use of a two-station fixturing arrangement with adjustable hold-down clamps, locating devices, and replaceable vertical and horizontal positioning pins, a special purpose machine is utilized in drilling and boring 76 different sizes and shapes of bell housings. Construction details, typical tool sizes and spindle speeds for boring and drilling, and some of the parts machined by it.

20A-45. Maintenance in Oil Refineries. Harvey S. Peters. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 74-77, 95.

Miscellaneous machine-shop operations.

20A-46. Automatic Profiling. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 92-93.

The "Pro-Turner", a profiling attachment which can be used on engine lathes, turrets, boring mills, planers, or precision horizontal boring machines.

20A-47. Man-Au-Trol for Mass Production. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 101.

Use of 36-in. Bullard "Man-Au-Trol" vertical turret lathe, primarily in machining the stators and end shields of electric motors.

20A-48. Computing Steps of Straight Form Tools. S. H. Balderson. *American Machinist,* v. 93, Jan. 29, 1949, p. 263.

Calculations are illustrated by a diagram.

20A-49. Planing With Carbides. *American Machinist,* v. 93, Jan. 29, 1949, p. 265, 267.

Information is given in the form of text, tables, and diagrams.

20A-50. Sharpening Cemented Carbide Tools With Silicon Carbide Wheels. J. C. Arndt. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 46, 80, 82.

Recommended procedures.

20A-51. An Unusual Cam Milling Fixture. Robert Mawson. *Iron Age,* v. 163, Jan. 27, 1949, p. 66-67.

Use for accurate and low-cost work.

20A-52. Practical Problems of Machinability. (Continued.) Chester M. Inman. *Metals Review,* v. 22, Jan. 1949, p. 16-17.

Reasons for dulling or failure of cutting tools and means for minimizing them.

20A-53. Tapped Holes for Screws and Studs. D. S. Stoneman. *Fasteners,* v. 5, no. 3, [1948], p. 10-13.

Successful tapping, although not difficult, involves careful consideration of the tapping machine, the tap, hole preparation, and speeds and lubricants to be used.

20A-54. Investigation of Plate Filters of Lubricating and Hydraulic Systems Used on Machine Tools. (In Russian.) A. Ya. Lopato. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 10-14.

Factors influencing dissociation, oxidation, contamination, and irrigation of coolants used in machining were investigated. Criteria of selection of filtration system and methods of design of filters.

20A-55. Anodic-Mechanical Grinding (Sharpening). (In Russian.) S. E. Noshov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 20-22.

Method consists in simultaneous electrolytic and mechanical action on the piece of metal to be ground or sharpened. The positive pole is connected to the object and the negative to the grinding disc, hardness of which can be many times less than that of the object to be ground. Details of the equipment, including electrical circuits.

20A-56. Influence of the Surface Activity of the Coolant on the Cutting Process and the Machinability of Metals. (In Russian.) N. A. Pleteneva and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 1, 1948, p. 501-504.

Experimental data indicate that surface-active coolants not only decrease the external friction, but take part in the cutting process by facilitating deformation in the layers adjacent to those being cut.

20A-57. Precision Machining Costs Cut by Use of Portable Jig Boring Tool on Aircraft Parts. *Steel,* v. 124, Feb. 7, 1949, p. 104.

20A-58. Metal Cutting Fluids—Their Selection, Application and Mainte-

nance. E. L. H. Bastian. *Iron Age,* v. 163, Feb. 10, 1949, p. 60-67.

A comprehensive review.

20A-59. Sharpening High-Speed Steel and Carbide-Tipped Hobs. Charles H. Wick. *Machinery* (American), v. 55, Feb. 1949, p. 149-157.

20A-60. Use and Care of Toolpost Grinders. J. F. Fischer. *Machinery* (American), v. 55, Feb. 1949, p. 184-187.

Application of toolpost grinders; selection of grinding wheels; and methods of adjusting grinding-wheel cutting action. (First of three articles.)

20A-61. Universal Boring-Bar for Turret Lathes or Radial Drilling Machines. Harold E. Murphey. *Machinery* (American), v. 55, Feb. 1949, p. 200-201.

20A-62. Scribing Tool for Circular Parts. H. Moore. *Machinery* (American), v. 55, Feb. 1949, p. 202.

20A-63. Lathe Fixture Bores to Exceptional Tolerances. R. W. Dayton and C. M. Allen. *American Machinist,* v. 93, Feb. 10, 1949, p. 89-91.

Boring technique in which accuracy is independent of the lathe. Test bearings 1¼-in. diam. are being made routinely to an accuracy of 0.00001-0.00002 in., and 4-in. bearings have been bored straight and round within 0.00003-0.00005 in. on standard machine-tool equipment. Principle involved is the support of an accurate cylindrical bar at four points and constraint of its motion to rotation and translation about its own axis.

20A-64. Air Clamps Unload Workers' Hands. J. V. Carlson. *American Machinist,* v. 93, Feb. 10, 1949, p. 92-93.

Various applications of air-operated fixtures to reduce over-all operation time in machine-shop work.

20A-65. Olds' V-8 Built With Ultra-Modern Tools. Chester S. Ricker. *American Machinist,* v. 93, Feb. 10, 1949, p. 94-97.

Machine-tool and inspection equipment and procedures.

20A-66. Practical Ideas. *American Machinist,* v. 93, Feb. 10, 1949, p. 120-124.

Includes the following: toolbar for machining long, thin slots (C.D. Mackinnon); use of countersunk plate and punch to form flat-head-screw dimple (S. D. Yarm); expansion of undersized threaded tubing by forcing balls through it (Sherman S. Cross); use of extra lead screw to guide threading tool (R. G. Dickens); self-aligning center punch (Charles E. Gray); simplified double-spline broach—inserted-teeth feature permits it to be made with ordinary tooling and setups on standard machines (G. R. Milner); use of two steadyrests for quick centering of long shafts (Lowell F. Stull); gage which aids in resetting boring-bar bits (Roger Isetts); and other miscellaneous shop hints.

20A-67. Smoothing Down Finishing Costs. *Applied Hydraulics,* v. 2, Feb. 1949, p. 16-18.

A surface-finishing machine operated by hydraulic and air circuits provides for both flat and adjustable contour movements. It is now in use in the cutlery, hardware, hand tool, and industrial fields.

20A-68. Cutting Costs With a Portable, Precision Boring Machine. *Tool & Die Journal,* v. 14, Feb. 1949, p. 42-43.

Tool of simple design and construction, made up of relatively few parts. It turns out jobs to tolerances as close as ± 0.00025 in.

20A-69. Toolmaking Aids for the Toolroom. Karl F. Kirchhofer. *Tool & Die Journal,* v. 14, Feb. 1949, p. 64-65, 68.

Combination angle plate and hole locater, height gage, adjustable toolmakers' square, and optical-center locater.

20A-70. Hydraulic Clamping Among Many Ingenious Tooling Devices at Link-Belt Plant. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 111-116.

Special-purpose machine tools, hydraulic clamping devices, multiple machining, and ingenious tooling. The milling of teeth in a reducer-wheel-flange face. The operation involves a flute, taper, and radial cut.

20A-71. Centerless Grinding With a Cammed Regulating Wheel. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 162-164, 166-167.

Equipment and procedures.

20A-72. Ideas From Readers. *Modern Machine Shop,* v. 21, Feb. 1949, p. 198-200, 202, 204, 206, 208.

"Fixture Equipped with Electric Signal to Indicate Proper Positioning," Clifford T. Bower; "Spring-Loaded Die Stop," Roger Isetts; "A Special Strap Wrench," E. R. Yarham; "Positive Print Cabinet," Bert Charlesworth; and "A Handy Boring Head," Robert Mawson.

20A-73. Developments in Carbide Grinding. F. J. Benn. *Tool Engineer,* v. 22, Feb. 1949, p. 17-21.

Comparative properties of different types of abrasive materials, use of silicon carbide wheels, selection of diamond wheels, offhand grinding, surface grinding, diamond concentration, and dressing of diamond wheels.

20A-74. Machining Metallized Surfaces. Thomas A. Dickinson. *Tool Engineer,* v. 22, Feb. 1949, p. 29.

Recommended procedures.

20A-75. Automatic Finishing Cuts Cost. A. E. Rylander. *Tool Engineer,* v. 22, Feb. 1949, p. 30-32.

The basic types of automatic finishing equipment, manufactured by Acme Mfg. Co., Detroit.

20A-76. High Production With Standard Equipment. Lloyd L. Lee. *Tool Engineer,* v. 22, Feb. 1949, p. 33.

By combining standard machine tools with standard auxiliary drilling units plus clever tool engineering, production outputs in many instances, equal those usually obtained with special-purpose equipment. One case is the drilling of eight holes in the bottom of a saw table, and three holes in each of the two sides.

20A-77. Cutting Tools and Fixtures. VIII. A. E. Rylander. *Tool Engineer,* v. 22, Feb. 1949, p. 38-39.

Fundamentals of tool design illustrated by a description of tooling for a part which has been specially "designed" to include a number of operations, all requiring cutting tools.

20A-78. Gadgets. *Tool Engineer,* v. 22, Feb. 1949, p. 40-41.

"Straightener for Coiled Spring Wire," M. C. Smith; "Handy Angle-Square," George Hull; "A Big Job on a Small Machine," Robert Mawson; "An Improvised Boring and Threading Tool," Edward Diskavich; and "Drift for Tanged Tools," George Hull.

20A-79. Dual Template Automatic-Cycle Method Slashes Gear Blank Machining Time. Thomas E. Swander. *Production Engineering & Management,* v. 23, Feb. 1949, p. 51-55.

A production increase of 37% is attributed to the use of two tracer-controlled machines.

20A-80. Carboloy Boring Bars Foster Precision. *Production Engineering & Management,* v. 23, Feb. 1949, p. 55.

Precision boring machine designed specifically for the use of solid cemented-carbide boring bars.

20A-81. Factors Affecting the Design of Jigs and Fixtures. Roger Isetts. *Production Engineering & Management,* v. 23, Feb. 1949, p. 56-58.

As applied to machine-shop operations.

20A-82. Mechanism Loads Gear Machines. *Production Engineering & Management,* v. 23, Feb. 1949, p. 58.

20A-83. (Book). **Metal Cutting Tools.** P. S. Houghton. 283 pages. 1948. Chapman & Hall, Ltd., 37, Essex St., London, W. C. 2, England. 25s.

Although the subject matter covers a wide range of tools, every endeavor has been made to leave out unnecessary details and concentrate on those tools on which information is usually most required. (From review in *Aircraft Production.*)

20A-84. (Book). **Turret Lathe Tooling.** Ed. 2. Howard Freeman, Sir Isaac Pitman and Sons, Ltd., 39, Parker St., London, W. C. 2, England. 12s. 6d. net.

Deals in the main with standard tooling, with the possible exception of the thread-rolling attachment and one or two other items.

20A-85. Planned Production. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 66-69, 94.

Miscellaneous machine-shop operations and equipment in production of precision tools for the airplane industry.

20A-86. Precision-Made Torches for Better Welding. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 70-73, 90, 98.

Machine-shop, cleaning, and finishing procedures.

20A-87. Tooling Specialists. Walter G. Rien. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 74-75.

Equipment of Specialty Engineering & Tool Co., Oakland, Calif.

20A-88. Modern Machines in Diesel Shop: Faster Production With "Fastermatic"; Boring Nine Bearings Simultaneously. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 76-77, 98.

Companion articles. Equipment and procedures at Enterprise Engine & Foundry Co., San Francisco.

20A-89. The Experimental Machine Shop. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 86, 98.

Work of Lovequist Engineering Co., Beverly Hills, Calif., in the main, is prototype machined parts for the aircraft industry.

20A-90. A New Manufacturing Method. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 91.

New machine tool which has seven work stations which carry the work from bar stock to finished product. Operations may include boring, turning, facing, threading, grooving, drilling, or any combination of operations performed in sequence simultaneously.

20A-91. Spinning Operation Solves Problem of Producing an Intricate

Part. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 28-31.

Details of screw-machine tooling for a 0.140-in. diam. chamber and a 0.040-in. diam. off center-hole within a part which has only a 1/16-in. hole drilled into its front face. In addition, a 0.1405-in. diam. cross hole is required which breaks through into the bottom of the 0.040-in. diam. off-center hole but not into the 0.040-in. diam. on-center hole.

20A-92. Two Types of Milling and Slotting Attachments for Multiple Spindle Bar Machines. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 33-37.

Two types of milling and slotting attachments designed for use on the New Britain Model 60 6-spindle automatic bar machines.

20A-93. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 38-41.

Five basic phases in turret-lathe practice which greatly affect the efficiency of any tooling job.

20A-94. Cutting Costs With Chucking Machines. J. T. Vinbury. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 43-47.

Complex part and method of production on the automatic multiple-spindle chucking machine. 21 operations are performed simultaneously.

20A-95. Table of Corrected Diameters on 10° Top-Rake Circular Tools for No. OG Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering,* v. 10, Feb. 1949, p. 48-51.

20A-96. The Machining of "Difficult" Materials. *Aircraft Production,* v. 11, Feb. 1949, p. 65-68.

Practical information on the cutting of high-Ni alloys, stainless steels, and cast irons.

20A-97. Fixture Determines Accuracy in Milling Slender Castings. *Steel,* v. 124, Feb. 21, 1949, p. 117-118.

20A-98. "Unmachinable" Turbo-Jet Parts Broached. Oliver W. Bonnafe. *American Machinist,* v. 93, Feb. 24, 1949, p. 77-80.

Heavy machines and fixtures, with careful tooling, make it possible to produce complex shapes on blade roots and in rotors and stators.

20A-99. Form Grinding Makes Better Latches. Rupert Le Grand. *American Machinist,* v. 93, Feb. 24, 1949, p. 82-83.

Production of circuit-breaker parts. Use of "toolroom" method produces a 30% time saving and improves quality.

20A-100. Improved Surface Finish Increases Tool Life. Thomas Badger. *American Machinist,* v. 93, Feb. 24, 1949, p. 86.

Experimental data. Surface-finish improvement from 30 to 5 microin. resulted in tool-life increases of 90 to 152%.

20A-101. How Counterbores Behave. *American Machinist,* v. 93, Feb. 24, 1949, p. 88-91.

Torque, thrust, and power for counterboring various materials with carbide-tipped and high speed steel tools can be computed for various feeds and speeds by use of the tables and charts presented. They are based on a comprehensive research investigation.

20A-102. Practical Ideas. *American Machinist,* v. 93, Feb. 24, 1949, p. 112-116.

Includes the following: scriber to mark arcs without center location (Clifford T. Bower); bending of U-bolts without thread damage (Dennis D. Unruh); peeling of Inconel-X round stock done on a 24-in. engine lathe by reversed process—instead of rotating the stock and turning with a fixed tool, the machine feeds the stock and the cutters revolve; toolholder for hogging cuts holds 16 bits, each of which takes a 1/16-in. cut; counterbore drills thin sheets (Bernard Levowich); dual-purpose toolholder (Dwight R. Page); broach-like planing tool slots thin plate (G. R. Milner); adaptation of lathe for special-thread cutting (William R. Baker, R. E. Moulton, and D. W. Hartzell—separate comments on contribution by Jack Everett); engine lathe fixture holds washers for boring (Roger Isetts); and other miscellaneous shop hints.

20A-103. Special Indexing Fixture Doubles Broaching Rate on Small Parts. Herbert Chase. *Steel,* v. 124, Feb. 28, 1949, p. 84-85.

Unique fixture equipped with six toggle clamps which facilitates work positioning and boosts broaching output.

20A-104. Speeds and Feeds to Use in Cylindrical Grinding. E. W. Wolff. *Iron Age,* v. 163, Mar. 3. 1949. p. 100-103.

Quick means for checking and setting up cylindrical grinding jobs to eliminate the time and material loss encountered in "cut-and-try" procedures.

20A-105. Simplified Contouring Controls. Roger Schuette. *Electrical Manufacturing,* v. 43, Mar. 1949, p. 124, 126, 128.

With one movement fixed, in and out motion of variable element is governed by a two-contact stylus, magnetic reversing clutches and a magnetic brake for contouring at-

tachment developed for Le Blond lathes.

20A-106. Talented Tooling. *American Machinist*, v. 93, Mar. 10, 1949, p. 98-99.
Diaphragm chuck grips ring gears; magnetic chucks hold propeller blades; carbide milling replaces gang planing.

20A-107. Practical Ideas. *American Machinist*, v. 93, Mar. 10, 1949, p. 120-124.
Includes the following: magnetic extension fixture for unusual grinding jobs on a surface grinder (Harry Smith); guides position bars for centering operation; finish-forming cutter made from bar-stock disc (G. R. Milner); carbon-block fixture for welding rods together (Don McIntosh); expanding rollers clamp box for welding (William H. Genich); drilling and tapping of dial holes on simple drill-press setup (Ray Cafiero); slotted plate helps reset boring-bar babbitts (Raymond E. Baldauf); templet for lathe cutting special shapes and radii (Arthur G. Ranslow); built-up broach for finishing cast cylinders (G. R. Milner); keyway broaching on low-power machine eased by use of roller chain (G. R. Milner); and other miscellaneous shop hints.

20A-108. Work or Tool Rpm. for Cutting Speeds From 40 to 1000 Sfpm. *American Machinist*, v. 93, Mar. 10, 1949, p. 139.
A table.

20A-109. A Practical Comparison of Mass Production Machines and General Purpose Machines. E. K. Morgan. *Automotive Industries*, v. 100, Mar. 1, 1949, p. 18-20, 50.
Typical situations in which general-purpose machine tools and mass-production equipment are used in production of diesel engine cylinder blocks and crankcases of integral construction. Basic factors for each type of equipment and costs of production.

20A-110. A New Alpha Alumina Abrasive. *Machine and Tool Blue Book*, v. 45, Mar. 1949, p. 158-160, 162, 164.
Use of new type in machine-shop operations.

20A-111. Shop Hints. *Machine and Tool Blue Book*, v. 45, Mar. 1949, p. 176, 178-182, 184.
"A Quick-Acting Milling Fixture," Robert Mawson; "Cutting Short Pipe on a Milling Machine"; "Splining Large Cutter Chain Sprockets"; and "Automatic Brushing Helps Reduce Bearing Costs."

20A-112. End Form Grinding Machine. *Iron Age*, v. 163, Mar. 10, 1949, p. 102.
Certain part details require profiled grinding on the end, hence they cannot be ground on usual centerless grinding machines. A novel variation is an end-forming machine.

20A-113. An Electronic Tool Cutting Pressure Indicator. *Machinery* (London), v. 74, Feb. 10, 1949, p. 175-176.

20A-114. Metal Swarf, Cutting Oils and Coolants; Methods and Equipment Used for Effecting Economies in the Use of Cutting Oils and in the Reclamation of Metal Swarf. H. M. Harman. *Machinery Lloyd* (Overseas Edition), v. 21, Feb. 12, 1949, p. 68-80.

20A-115. Special Jig and Fixture Unifies Drilling and Inspection Procedure. Robert Mawson. *Steel*, v. 124, Mar. 14, 1949, p. 124, 126.
A typical case in which it is not necessary to locate jigs and fixtures on a finished surface. It is a caster-roll swivel bracket, which, when assembled, does not have to fit either into or against any other detail.

20A-116. Simple Method for Machining Multiple Thread Screws. Bruce Thomas. *Modern Machine Shop*, v. 21, Mar. 1949, p. 168-170, 172, 174, 176.
Recommended procedures for American Standard and square threads.

20A-117. Ideas From Readers. *Modern Machine Shop*, v. 21, Mar. 1949, p. 198, 200, 202, 204, 206, 208, 210.
"Parts Tray for Vise Carriage," Robert G. Ellis; "Drill Jig for Hollow Milling, Drilling, and Reaming," Robert Mawson; "Drill Press Used as a Centrifuge," Frank Charity; "Method of Machining Symmetrical Workpieces," Edward Diskavich.

20A-118. Toolpost Grinders in Production Operations. J. F. Fischer. *Machinery* (American), v. 55, Mar. 1949, p. 162-165.
Applications of toolpost grinders. (Second of three articles.)

20A-119. New Developments in Centerless Thread Grinding. Cecil W. Hopkins. *Machinery* (American), v. 55, Mar. 1949, p. 175-180.
New developments incorporated in machine built by Landis Machine Co. Threads up to 1⅞ in. in diam. and as coarse as 8 per in. can be ground economically from the solid.

20A-120. Tool Engineering Ideas. *Machinery* (American), v. 55, Mar. 1949, p. 193-196.
"Fixtures for Milling Drill-Chuck Jaws," Harold E. Murphey; "Double Combination Die for Producing Two Different Parts," Burnett Menkin; and "Marking Punches for Simplifying Lay-Outs," Robert Mawson.

20A-121. Drilling Square Holes on Lathe. Joseph Albin. *Iron Age,* v. 163, Mar. 17, 1949, p. 98.

20A-122. Trends in Modern Milling Machines. A. O. Schmidt. *Tool Engineer,* v. 22, Mar. 1949, p. 17-20.

Relation of cutter and milling-machine design, power requirements as affected by radial rake angles, cutting material, use of cutting fluid, etc. Tabulates power required to mill representative metals.

20A-123. Perspectives of Broaching. John A. Markstrum. *Tool Engineer,* v. 22, Mar. 1949, p. 21-23.

Developments in broaching fixtures and tools.

20A-124. Review of Tap Design and Operation. Herman Goldberg. *Tool Engineer,* v. 22, Mar. 1949, p. 26-28.

States that "more progress has been made in tapping in 1948 than in the previous 20 years." New equipment for production tapping.

20A-125. Parting Tool Design. C. E. LeRow. *Tool Engineer,* v. 22, Mar. 1949, p. 34.

Design recently patented by Westinghouse. The time required for cutting off material with this type of tool is said to be considerably shorter than with conventional cut-off tools.

20A-126. The Fundamentals of Tool Engineering. IX. A Résumé on Metal Cutting. A. E. Rylander. *Tool Engineer,* v. 22, Mar. 1949, p. 41-42.

Typical milling-machine setup. (Part of a series for the student.)

20A-127. Gadgets. *Tool Engineer,* v. 22, Mar. 1949, p. 43-44.

"Boring Bar Fabricated for Brazing," C. W. Frank; "Two Squareness Gages," Paul H. Winter; "Equalizing Fixture for Round Work," Frank J. Peragine; "Expanding Washer for Broached Work," George G. Hasselberg; and "Lipped Tong for Heavy Work," E. Guilbert.

20A-128. Davenport Automatic Produces Intricate Part With Non-Rotating Work Spindles. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 21-26.

Many instances arise where, in order to perform a cross-drilling or milling operation, or to drill an eccentric hole, stopped spindles are required in one or two machine positions. Unique setup which produces a part on the automatic screw machine with all work spindles stopped in every tooling position.

20A-129. Attachments and Tools Used on Chucking Machines. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 28-32.

20A-130. Turret Lathe Practice. E. L. Marray. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 40-45.

Includes charts compiled as an aid in calculating power requirements for different materials at varying depths of cuts.

20A-131. Potter & Johnston 3U Speedflex Automatic Turret Lathe. *Screw Machine Engineering,* v. 10, Mar. 1949, p. 47-52.

Includes a variety of typical tooling set-ups.

20A-132. Improved Friction Saw Eliminates Burring. *Production Engineering & Management,* v. 23, Mar. 1949, p. 64.

20A-133. An Efficient Tool Grinding Room Keeps Ford Plant Humming. L. R. Lee. *Production Engineering & Management,* v. 23, Mar. 1949, p. 66-68.

20A-134. (Book.) **Cemented-Carbide Tools.** 62 pages. Machinery Publishing Co., Ltd., 52-54, High Holborn, London, W. C. 1, England. (Machinery's Yellow Back Series No. 6.)

Carbides and bonding agents used for metal cutting; the design, care and maintenance of tipped tools; production of the tools by sintering.

20A-135. (Book.) **Manual of Die-Head Thread Cutting.** H. Schlarman. 266 pages. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18. $3.50.

A noteworthy contribution to the metalworking industry because it will help shopmen to identify everyday troubles and apply corrective measures. (From review in *American Machinist.)*

20A-136. Crush-Ground Profiles Cut Plug Costs. C. D. Caulton and J. E. Safhill. *American Machinist,* v. 93, Mar. 24, 1949, p. 98-99.

How crush grinding reduces tool costs 50% and more, improves quality, and gives longer tool life between grinds in manufacture of switchboard plugs in England.

20A-137. Straight Cut-Off Blades. *American Machinist,* v. 93, Mar. 24, 1949, p. 145.

American Standard ASA B5.21-1949 developed by ASME. It covers straight cut-off blades for lathes and screw machines.

20A-138. Practical Ideas. *American Machinist,* v. 93, Mar. 24, 1949, p. 125-130.

Includes the following: heavy sine plate for mounting light grinding work (Allan B. Nixon); multi-bit tooling replaces solid tool for boring long cylinders (Arthur Silvestor); double-tool setup for cutting double threads (Wilson A. Beard); stepped plug gage as aid to fine-

tolerance internal grinding (G. R. Milner); adjustable gage for checking internal grooves (S. R. Welling); production of beveled edges on spur gears on a milling machine (C. D. Mackinnon); vise squeezing extends life of boring bit (G. R. Milner); tapered-sleeve stop for short work chucked in the lathe (Grover C. Russell); strip-steel notching permits continuous lithography on oil-filter covers (Chester S. Ricker); chuck centers air gun used to center drill billets (K. C. Bland); ring gages for checking taper against master plug (C. D. Mackinnon); and other miscellaneous shop hints.

20A-139. Automatic Balancing of Grinding Wheels. *Industrial Diamond Review,* new ser., v. 9, Feb. 1949, p. 38. Based on pamphlet by A. H. Dall.

Device which consists of a hollow ring containing three balls, which, when rotated, bring the wheel into a balanced position. The balls are afterwards clamped so that the wheel remains in this position.

20A-140. Cromwell 3½ in. Precision Lathe. *Industrial Diamond Review,* new ser., v. 9, Feb. 1949, p. 39-43.

Description of machine tool. Typical production results on duralumin and phosphor bronze.

20A-141. Effective Station to Station Motions; Key to Further Machining Productivity. Ralph E. Cross. *Steel,* v. 124, Mar. 28, 1949, p. 70, 85.

Advantages of transfer mechanism to carry work from one station to another on multiple-station tools; each station is a machine in itself.

20A-142. Harnessed Hydraulic and Pneumatic Power. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 93-95.

Machine-shop operations in manufacture of pneumatic and hydraulic cylinders and valves. Steel and aluminum are used.

20A-143. The Production Machine Shop and Broaching Member. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 103.

Procedures and equipment of Harford Manufacturing and Broaching Co.

20A-144. "Bandurko" Type Screw-Cutting Head for Pipes. B. A. Kurenkov. *Engineers' Digest,* v. 10, Feb. 1949, p. 61-62. Translated and condensed from *Stanki i Instrument* (Machine Tools and Instruments), Dec. 1947, p. 12-16.

New design claimed to have several advantages.

20A-145. Bar Extension Tubes for Capstan Lathes and Automatics. W. F. Troescher. *Engineers' Digest,* v. 10, Feb. 1949, p. 63-64. Translated and condensed from *Werkstatt und Betrieb,* v. 81, June 1948, p. 158-161.

Bar materials must be fed into the hollow spindles of capstan lathes and automatics through long extension tubes which can be designed as fixed or rotating tubes, with or without an internal elastic or shock-damping lining. Practical and mathematical analyses for medium and high-spindle speeds, resulting in design recommendations.

20A-146. Tailoring Sheet Metals With Saw Bands. H. J. Chamberland. *Sheet Metal Worker,* v. 40, Mar. 1949, p. 37-40.

Large savings in time and costs over conventional band sawing are cited for friction sawing, which, however, is applicable only to ferrous metals. High-speed and conventional sawing and their applications.

20A-147. Chip Breakers and Chip Formers. M. Lang. *Machinery* (London), v. 74, Mar. 10, 1949, p. 298-301. Translated and condensed from "Werkstattblatt 139 Spanformer und Spanformstufen", Ed. 1, July 1948, Carl Hanser Verlag, Munich, Germany.

Results of extensive experiments on methods for obtaining satisfactory chips (as small as possible) during machining operations. Two methods which give good results are: use of a chip breaker or chip-forming step on the rake face of the tool; and use of a special adjustable chip former on top of the tool.

20A-148. Sawing Attachment for Cutting Off Wedge-Shaped Washers on an Automatic. *Machinery* (London), v. 74, Mar. 10, 1949, p. 304-305.

20A-149. Light Drillpresses Are Versatile Tools. H. E. Linsley. *American Machinist,* v. 93, Apr. 7, 1949, p. 101-108.

Examples of ingenious setups that have been successfully operated in metalworking and that reduce production time or substitute for expensive special-purpose machines.

20A-150. Practical Ideas. *American Machinist,* v. 93, Apr. 7, 1949, p. 120-124.

Includes the following: automatic shop-made pinion cutter (Joseph F. Budnick); truing of inaccurate lathe-chuck jaws (Thomas Gray); spring mandrel clamps rings for accurate machining (Charles Schwartz); templet gage aligns multiple bits on high-production lathes (Stanley R. Welling); standard shapes reduce costs of jigs and fixtures (Harold

Reaney); spring-loaded pin locates swinging bushing plate (Roger Isetts); 3-point cantilever beam aligns machine components (Michael P. Blake); surface gaging on magnetic table or chuck without cutting off power by use of nonmagnetic surface plate (James E. Avery); adjustable-angle parallel positions work in vise (Allan B. Nixon); lead pins align punch and die for hole punching (Henry G. Berndt); and other miscellaneous shop hints.

20A-151. Multiple Spindle Drill Heads—Their Applications and Characteristics. H. K. Ferger. *Machine and Tool Blue Book,* v. 45, Apr. 1949, p. 103-108, 110, 112.

20A-152. Special Tooling Aids Building of Automatic Machines. R. F. V. Stanton. *Modern Machine Shop,* v. 21, Apr. 1949, p. 102-106, 108, 110-111.

Some of the special tools used in the manufacture of high-speed tobacco-processing machinery.

20A-153. Handy Clamping Devices. Bernard J. Wolfe. *Modern Machine Shop,* v. 21, Apr. 1949, p. 168-170, 172, 174, 176, 178, 180, 182, 184.

Design and application of several practical clamping devices, primarily as applied in machining operations.

20A-154. Accurate Form-Grinding of Internal Surfaces. George H. DeGroat and Paul J. Koelbel. *Machinery,* v. 55, Apr. 1949, p. 146-148, 164.

How it is accomplished by application of an improved method of mounting the small grinding wheels employed in such operations.

20A-155. Automatic "Rough-Finish" Cycle Cuts Costs of Machining Bearings. *Machinery,* v. 55, Apr. 1949, p. 150-152.

New type engine lathe is making it possible for a Midwest manufacturer to increase his production of bronze and cast-iron sleeve bearings by as much as 700%.

20A-156. Hydraulic Mechanism for an Abrasive Cut-Off Machine. George H. DeGroat. *Machinery,* v. 55, Apr. 1949, p. 181-182.

20A-157. Tool Engineering Ideas. *Machinery,* v. 55, Apr. 1949, p. 183-186.

"Automatic Mechanically Operated Milling Fixture", Robert Mawson; "Designing Parts for Economical Die Production", Federico Strasser; "Lathe Dog for Gripping Narrow Shoulders", H. Moore; and "Internal Threading Tool Designed to Eliminate Set-Up Gages", W. G. Hallam.

20A-158. Regrinding of Jaws for Self Centering Chucks. J. R. Paquin. *Tool Engineer,* v. 22, Apr. 1949, p. 21.

Improved procedure.

20A-159. Portable Jig Borer. *Tool Engineer,* v. 22, Apr. 1949, p. 32-34.

Convair saves setup time with low-cost device especially adaptable to components too large to handle on stationary boring machines, and to fittings already installed on completed major assemblies.

20A-160. Common Machining Difficulties and Their Correction. *Tool Engineer,* v. 22, Apr. 1949, p. 43-44.

The tabular presentation, covering single point, flat, and circular forming tools, and multiple-point rotating tools.

20A-161. Mist Coolant System Improves Cutter Grinding. *Iron Age,* v. 163, Apr. 7, 1949, p. 92.

Equipment developed.

20A-162. A Jig and Fixture Program. H. C. Tsien. *Tool & Die Journal,* v. 15, Apr. 1949, p. 42-47, 82.

Design of three milling fixtures and two drill jigs which are proposed to complete all operations on a cast iron adjusting head.

20A-163. Jig and Fixture Designs. Robert Mawson. *Tool & Die Journal,* v. 15, Apr. 1949, p. 48, 50-51.

A welded drill jig and a positive boring fixture.

20A-164. Air-Actuated Holding Fixtures. *Tool & Die Journal,* v. 15, Apr. 1949, p. 52, 54, 56.

An air motor operates the holding fixture, actuates the feeding mechanism of the machine, and ejects the workpiece from the fixture by exhaust air.

20A-165. New Roll Grinding System Uses Abrasive Belts. *Steel,* v. 124, Apr. 11, 1949, p. 108.

Newly-developed system for roughing and finishing of all types of rolls, which can be used with or without removing them from the rolling machine. Rolls which are difficult to grind by other methods reportedly can be ground to close tolerances and to a fine finish by this method.

20A-166. Making Motor Car Fuel Pumps. *Machinery* (London), v. 74, Mar. 31, 1949, p. 395-401.

Forming and machine-shop operations.

20A-167. New Diamond Wheel Recommendations for Carbide Grinding. F. J. Benn. *Industrial Diamond Review,* new ser., v. 9, Mar. 1949, p. 75-77.

Recommendations with respect to selection of bond; grit size; grade

or hardness; and diamond concentration. Operating hints.

20A-168. Production of Accurate Conical Holes. E. Muenchow. *Industrial Diamond Review,* new ser., v. 9, Mar. 1949, p. 80-84.

Special boring bar and auxiliary equipment said to have advantages over other methods. The equipment was developed in Germany.

20A-169. Hydraulic Equipment. Part I. Manufacture of Undercarriage Components at Electro-Hydraulics, Ltd.; Machining Methods; Deep Bores; Superfinishing. Part II. Manufacture of Components at Electro-Hydraulics, Ltd.; Machining Thin-Walled Work; Furnace Brazing; Fixtures. *Aircraft Production,* v. 11, Mar. 1949, p. 97-102; Apr. 1949, p. 136-140.

20A-170. Anchor Bushings; Spot-Welding Drill-Bushes to Flexible Templates. *Aircraft Production,* v. 11, Apr. 1949, p. 141.

New technique facilitates the drilling of curved surfaces. Each anchor bushing consists of a hardened steel bush pressed into a low-carbon steel anchor-plate; the lower end of the bush projects below the level of the anchor-plate and serves as a spigot for locating the bushing on the templet. Hole centers are first laid out in the usual way and a hole is formed to receive the spigot-diameter of the bush which is then inserted into the hole. The bushing is attached to the templet by a single spot weld at each end of the anchor-plate.

20A-171. Air-Hydraulic System Simplifies Design. Clarence Johnson. *Machine Design,* v. 21, Apr. 1949, p. 149-152.

By ingenious use of compressed air in conjunction with a hydraulic control system, many of the advantages of a hydraulic-feed system without its complications are realized. Developed in several sizes, it may be used for milling, drilling, or boring.

20A-172. Comparison of Productive Potentialities of Machines and Cutting Properties of Instruments During Ordinary and Rapid Machining. (In Russian.) A. I. Kashirin and B. A. Sak-Shak. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 3-9.

Proposes a theoretical method for comparative evaluation. Productive potentiality and cutting properties are broken down into basic components which appear as variables in the proposed formulas.

20A-173. Efficient Methods of Cutting During Rapid Operation of Milling Machines. (In Russian.) M. N. Larin. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 9-13.

New equations for cutting rate are proposed on basis of investigation of factors influencing machining.

20A-174. Internal Cooling of Cutting Tools as a Means of Increasing Efficiency of Rapid Cutting. (In Russian.) B. T. Prushkov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 20.

The temperature of a cutting instrument can be decreased 30%, thus allowing an increase of cutting speed, for ordinary steels, of 5-8%; for high speed steels, of 11-26%; and for hard-metal cutting tips, of 34%.

20A-175. Work of the VNII (War Scientific Research Institute) on Rapid Cutting of Metals. (In Russian.) *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 25-29.

Results of work on 28 specific problems by the Russian War Scientific Research Institute during the past 4½ years.

20A-176. Tools Equipped With Hard-Metal Tips Produced by "Glavinstrument MSS." (In Russian.) *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Nov. 1948, p. 29-32.

Different types of cutting tools produced by Soviet plant. Methods of their production and optimum conditions of application.

20A-177. Industrial Electronics and Its Application to Automatic Control of Linear Dimensions. (In Russian.) A. I. Boyarov, A. A. Fel'baum, and A. I. Shchukin. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Dec. 1948, p. 1-7.

The possibility of applying electron-tube circuits in machining to control of dimensions of the finished products. Such devices may be used to control thickness of the surface layer, its hardness, modulus of elasticity, and pressure of the cutting tool. Such control is much more sensitive than contact electrical-measurement apparatus.

20A-178. New Type of Milling Machines for Rapid Operation. (In Russian.) I. G. Turchaninov. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Dec. 1948, p. 7-9.

Convenient arrangement for adjustment of the cutting tools. Optimum conditions of operation.

20A-179. (Book.) **Handbook for Estimating Machining Times.** T. W. Gor-

gon. 163 pages. Machinery Publishing Co., Ltd., National House, West Street, Brighton, England. 12s. 6d. net.

For the use of rate-fixers, production planners, and others concerned with a rapid and accurate calculation of production times. Based on results of investigations in Britain, the Continent, and in the U. S., verified or adjusted by observations of the author. Production aspects of turning, milling, drilling, and grinding.

20A-180. (Book.) **Fine Surface Finish.** Sydney F. Page. 179 pages. Chapman & Hall, Ltd., 37 Essex St., London, W. C. 2, England. 16s.

Controlled surface finish, comparison of lubricated surfaces, and metallurgy of machined surfaces, machining, grinding, and operations employed to produce a fine surface, surface-finish measurements, and inspection-department requirements. Research on the subject, including such aspects as the influence of tool shape, tool material, and cutting fluids.

20A-181. (Book.) **Schleifen und Werkzeugschleifen.** (Grinding and Tool Grinding.) Ernst Widmer. 62 pages. R. Winter Verlagsbuchhandlung, Zurich, Switzerland.

Grinding wheel and grinding operations, tool grinding in particular being dealt with. Truing grinding wheels by diamond tools, the correct drag angle of the diamond being stressed. Grinding of hard-metal tipped tools.

20A-182. Tooling Chucking Automatics. *Screw Machine Engineering,* v. 10, Apr. 1949, p. 22-25.

Dimensional requirements and machine tool setups for a forged yoke of complex design.

20A-183. Single Job, Three Case Histories, Illustrate Modern Tooling Methods. *Screw Machine Engineering,* v. 10, Apr. 1949, p. 32-36.

Complete tooling of a specific screw-machine product. Procedure includes tooling on three different multiple-spindle bar machines of the same make. Production time and added operations in each instance.

20A-184. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Apr. 1949, p. 38-42.

Methods by which turning, facing, and boring operations can be accomplished on the turret lathe.

20A-185. Pitfalls to Avoid in Tooling Screw Machines. Part Ten. Noel Brindle. *Screw Machine Engineering,* v. 10, Apr. 1949, p. 45-49.

Types of problems encountered in choosing a suitable method for manufacturing parts on the automatic screw machine. Three typical examples.

20A-186. Distribution of Heat Generated in Drilling. A. O. Schmidt and J. R. Roubik. *Transactions of the American Society of Mechanical Engineers,* v. 71, Apr. 1949, p. 245-248; discussion, p. 248-252.

Object of investigation was to determine the amount of heat which goes into the workpiece, chips, and drill at different cutting speeds and feeds. A tubular test bar of extruded Dowmetal was used as the workpiece, thus making the cutting action of the drill similar to that of a single-point tool. The total heat, the heat in the chips, and the heat in the drill were measured separately in a calorimeter.

20A-187. Grinding Fine-Pitch Gears. A. S. Beam. *Machinery* (London), v. 74, Apr. 7, 1949, p. 443-445. A condensation.

20A-188. Automatic Chuckers Feature High Production and Efficiency. Gus Carlson. *Iron Age,* v. 163, Apr. 21, 1949, p. 78-83.

Advantages in machining a wide variety of work.

20A-189. Multiple-Unit Castings Reduce Loading Time. Chester S. Ricker. *American Machinist,* v. 93, Apr. 21, 1949, p. 84-85.

Application to cut total machining time per piece. A group of identical units are cast as one piece, machined, then the connecting metal sawed out by a gang saw.

20A-190. Practical Ideas. *American Machinist,* v. 93, Apr. 21, 1949, p. 111-116.

Compact dividing head positions small work (C. Jaikens); thread-rolling on shaper (E. C. Schlenker); pneumatic tool lift on planing machine reduces wear, work time, improves quality and accuracy (R. J. Henkes); tapping nuts on turret lathe (T. W. V. Morgan); reciprocating stone on lathe for lapping and superfinishing (Aaron H. Shum); fixture for grinding front-clearance angles on toolbits (Federico Strasser); machining and grinding segmented ring by use of adapters (F. Forquer); tailstock-mounted fixture for turning external radii (John Homewood); fixture plate holds small parts on grinding table (J. R. Paquin); piloted drill-press tool chamfers shaft ends (Roger Isetts); and other miscellaneous shop hints.

20A-191. Entwicklungslinien im Werkzeugmaschinenbau. (Machine-Tool De-

velopments.) Rolf Lambertz. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Feb. 15, 1949, p. 73-81.
38 ref.

20A-192. Air Age Machine Shop. A. R. Frank. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 75-77.
Equipment and procedures.

20A-193. Duplicating Lathe Cuts Machine Time. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 96.
Its use.

20A-194. Electrical Drives for Machine Tools. Georg Schlesinger. *Machinery* (London), v. 74, Apr. 21, 1949, p. 510-513.

Varied requirements and need for standardization. Suggests a motor design based on interchangeable parts to meet contradictory requirements.

20A-195. Mass Production Techniques for Building Special Application Machines. Gerald Eldridge Stedman. *Production Engineering & Management,* v. 23, May 1949, p. 41-44.
Various machine tools and procedures used in manufacture of machines for producing crown corks, thread and lug caps, and other types of metal closures for liquid containers.

20A-196. Work-Holding Methods for Jigs and Fixtures. Robert Mawson. *Tool & Die Journal,* v. 15, May 1949, p. 46-48, 50.
Typical set-ups. Need for finished surface on the workpiece.

20A-197. Broaching "Christmas Tree" Slots in Jet Engine Rotors. *Tool & Die Journal,* v. 15, May 1949, p. 64-65.
Special equipment.

20A-198. Applying the Vertical Shaper to Tooling and Production. *Tool & Die Journal,* v. 15, May 1949, p. 60-62.

20A-199. Some Machine Tool Control Circuits. L. Hesse. *Electrical Manufacturing,* v. 43, May 1949, p. 110-115.
Three examples demonstrate effective combination of air and hydraulic circuits with electrical controls to simplify mechanical design, reduce maintenance, and increase flexibility of functions.

20A-200. Modern Equipment at Work. *Modern Machine Shop,* v. 21, May 1949, p. 202-204, 206, 208, 210.

"American Duplex Surface Broaching Machine Used for Broaching Diesel Bearing Supports"; "Sheffield Multichek Used to Check Piston Dimensions"; "Swiss Precision Jig Borer in Use at Baker Brothers Plant"; "Snyder Multiple Operation Machine Used for Automotive Assemblies".

20A-201. Ideas From Readers. *Modern Machine Shop,* v. 21, May 1949, p. 214-216, 218, 220.

"Fixture Designed for Boring Spherical Holes", Aaron H. Shum; "Auxiliary Control for Shear", Clarence Reynolds; "Protractor on Emery Grinder Rest Aids in Angle Grinding", A. H. Waychoff; and "A Method of Checking Pitch Diameter Runout", E. P. McKitrick.

20A-202. Unit Tooling; Developments in the Wharton Universal System. *Aircraft Production,* v. 11, May 1949, p. 174-176.

Recent modifications of the Wharton universal system of jig and fixture construction which is based on the assembly of standardized units or elements.

20A-203. Talented Tooling. *American Machinist,* v. 93, May 5, 1949, p. 94-95.

Tunnel broach machines at high speed; boring-machine turret positions valve parts; indexing plate clamps sprockets for spline broaching; and cradle loads billiard balls for grinding.

20A-204. How to Choose and Use Files. Grant Loader. *American Machinist,* v. 93, May 5, 1949, p. 101-108.

Types of metalworking files, how to select the right kind of file for the job, how to use files correctly, and how to take care of them.

20A-205. Practical Ideas. *American Machinist,* v. 93, May 5, 1949, p. 119-124.

Includes the following: safety devices on hand miller permit semi-automatic cycle (Glenn E. Shopbell); inexpensive toolholder increases cutter height (Roger Isetts); spring plunger aligns flat-head thumbscrews (Kinson Kwauk); soldered bushings locate punch holes in die blocks (Paul E. Wasser); making torque-converter blades from extrusions by unusual diagrammed technique (Chester S. Ricker); checking custom-made micrometers for parts up to 70-in. diam. (Robert A. McCloud); drum-and-cable attachment for lathe permits taper turning (Wendell H. White); grooving tool mounts off-center cutter (L. J. Visser); cutting longitudinal slots in short tubing on the lathe (Aaron H. Shum); angle-plate setup for shaping grinding wheels (Arnold Gamalsky); centering device locates shaft in steadyrest (Samuel C. Smith); wire guide facilitates spring winding (Lowell F. Stull).

20A-206. Rack Slotting in a Rise and Fall Miller. *Iron Age,* v. 163, May 5, 1949, p. 87.

Milling procedure for tabular racks on IBM electric typewriters. These require straight slots on one face of the bar and arc-shaped ones on the other.

20A-207. Broaching Typewriter Parts. *Iron Age,* v. 163, May 5, 1949, p. 97.

Steel carriage rails with a V-groove rolled into one side and Al die-cast key-lever bearings are among the parts for IBM electric typewriters that are processed in horizontal broaching machines.

20A-208. Wear Proofing Centerless Grinder Rests. *Iron Age,* v. 163, May 5, 1949, p. 100.

Use of brazed-on strips of cemented carbide along the length of the rest is reported to increase the life of these parts more than 350 times.

20A-209. Drilling Bush Attached to Portable Drills. M. Reichner. *Engineers' Digest,* v. 10, Mar. 1949, p. 100. Translated and condensed from *Werkstatt und Betrieb,* v. 81, June 1948, p. 163.

Drilling small holes with a portable drill often results in drill breakage. A simple jig which can be fitted to electrical and other portable drills and has been proved to prevent frequent drill breakage.

20A-210. Electrolytic Tool Sharpening. S. E. Noshov. *Engineers' Digest,* v. 10, Mar. 1949, p. 95-97. Translated and condensed from *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Oct. 1948, p. 20-22.

Previously abstracted from orinal source, item 20A-55, 1949.

20A-211. Multiple Spindle Drill Heads. H. E. Scheibe. *Engineers' Digest,* v. 10, Apr. 1949, p. 129-132. Translated and condensed from *Werkstatt und Betrieb,* v. 81, Nov. 1948, p. 309-315.

20A-212. Helical Gears Cut on "Solid Table" Machines. No. I. Distribution and Amount of Errors. S. A. Couling. *Engineer,* v. 187, Apr. 22, 1949, p. 430-432.

Explanation based on theory and experiment of the fact that a relatively high number of teeth in the master worm wheel of a hobbing machine without the creep mechanism is necessary in order to produce cut gears which are free from "hobber" noise. Inaccuracies of the index drive; relationship of worm-wheel error to number of teeth on the cut gear; and amplitude of imposed worm-wheel error. The latter was measured experimentally.

20A-213. Producing a Square Hole on a Multiple-Spindle Automatic. *Machinery* (London), v. 74, Apr. 28, 1949, p. 545-546.

Ingenious tooling set-up.

20A-214. Drilling and Tapping Machines Mounted on Ways to Increase Work Range. F. J. Austin. *Machinery,* v. 55, May 1949, p. 152-153.

Unusual set-ups: horizontal drilling and tapping machine on ways constructed along one side of long floor plates enables drilling, tapping, and facing operations on Diesel-engine blocks to be conveniently performed; and portable drilling and tapping machine is used for producing 80 holes around a large drying kiln.

20A-215. Selection of Carbide Grades and Recommended Cutting Speeds. *Machinery,* v. 55, May 1949, p. 162-164. Condensed from "Carboloy Tool Manual," to be published by Carboloy Co.

Information on grades of carbide to be employed in machining various types of metal and on recommended speeds.

20A-216. Toolpost Grinders in Tool-Room and Maintenance Work. J. F. Fischer. *Machinery,* v. 55, May 1949, p. 165-167.

Last of three articles describing various applications of toolpost grinders.

20A-217. Tool Engineering Ideas. *Machinery,* v. 55, May 1949, p. 183-186.

"Fixture for Holding Thin-Walled Castings in a Lathe", Frank J. Peragine; "Fixture for Multiple Broaching of Tapered Grooves", Harold E. Murphy; "Quick-Acting Drill Jig", Robert Mawson; and "Double-Action Clamping Device", F. Server.

20A-218. Abrasive Cut-Off Wheels: Their Selection and Use. B. G. Ebbeson. *Tool Engineer,* v. 22, May 1949, p. 17-20.

Recommendations applicable to a wide variety of metallic and non-metallic materials.

20A-219. Cutting Tools and Fixtures. (Concluded.) A. E. Rylander. *Tool Engineer,* v. 22, May 1949, p. 43-44.

With comments on drilling, tapping, and boring the part shown in Installment No. 8.

20A-220. Gadgets. *Tool Engineer,* v. 22, May 1949, p. 47.

"Method for Angular Milling", Robert Mawson; "Vise Jaw With Graduated Scale", C. W. Frank; and "To Preserve Layout Lines", Federico Strasser.

20A-221. Skiving Solves Production Problems on Long Contoured Part.

Screw Machine Engineering, v. 10, May 1949, p. 22-25.

20A-222. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, May 1949, p. 32-37.

Application to various jobs.

20A-223. Longitudinal Turning Attachment Aids in Completing Intricate Part. *Screw Machine Engineering,* v. 10, May 1949, p. 44-48.

20A-224. When and How to Use Carbide Insert Cutting Tools. J. S. Gillespie. *Iron Age,* v. 163, May 12, 1949, p. 84-89.

How tools and toolholders should be designed, applied and maintained, with particular emphasis on holder design and grinding of the inserts.

20A-225. Cutting Hydraulic Pump Gears. *Iron Age,* v. 163, May 12, 1949, p. 94-95.

Process which solves a number of difficult manufacturing problems not encountered in production of conventional gearing, and also reduces production time many fold. Basis of the process is the Shear-Speed gear cutting machine which employs form tools rather than generating tools and cuts all teeth of the pump gear simultaneously.

20A-226. Quick-Acting Fixtures Simplify Machining. Fred A. Worley. *American Machinist,* v. 93, May 19, 1949, p. 96-97.

Fixture and operations on pump and valve body castings.

20A-227. Practical Ideas. *American Machinist,* v. 93, May 19, 1949, p. 126-130.

Includes the following: grown-up boring-bar holder acts as simple turret (Allan B. Nixon); cam-checking setup gives dial-indicator accuracy (Gerhard Wenke); clamp lever forces work onto countersinking tool (E. C. Schlenker); sleeve templet aids in accurate recessing (H. Moore); light holder speeds dressing (Joseph Z. Madaras); shim cutter gages widths (J. A. Raught); tension rod and indicator gage broaching force (A. Vetsch); special angle plate features adjustable bar (Allan B. Nixon); drill stop controls hole depth to four thousandths (N. Bownass); soft mandrel centers parts (Fred H. Lingenfelder); and other miscellaneous shop hints.

20A-228. (Book.) **Carboloy Tool Manual.** 190 pages. Carboloy Co., Inc., 11155 E. 8-Mile Dr., Detroit 32, Mich. 50c; free to supervisory personnel.

Design, manufacture, and application of single-point carbide tools. Divided into 10 sections on tool design; chip-breaker design; selection of grades and recommended speeds; brazing; tool grinding; chip-breaker grinding; application of tools; trouble-shooting; tool control and method selection; and inspection.

20A-229. (Book.) **Engineering Materials and Processes.** L. H. Hancock. 214 pages. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London, W.C. 2, England. 15s. net.

Arranged in five parts devoted to materials, machine tools, processes requiring heat, testing of materials, and jigs and fixtures. Written for students in the third year of mechanical engineering.

20A-230. (Book.) **Toleranzen und Lehren.** (Tolerances and Gages.) Paul Leinweber. Springer-Verlag, Jebenstrasse 1, Berlin-Charlottenberg 2, Germany. 8.40 marks.

Intended primarily for the machine designer. Individual chapters deal with the various classes of fits. The types of gages, their proper use in shops and assembly rooms, and methods of their construction. Examples follow the theoretical discussion of gages of every variety.

20A-231. Machine Tool Lubrication on the Production Line. *Lubrication,* v. 35, May 1949, p. 49-60.

Lubrication systems for machine tools. Lubricant recommendations and a simplified lubrication plan.

20A-232. Automatic Systems Will Boost Tomorrow's Auto Production. Don G. Gumpertz. *Western Metals,* v. 7, May 1949, p. 24-25.

As observed in an Eastern automobile factory. Answers series of questions which are usually asked by interested executives.

20A-233. Precision Production of Chris-Craft Outboard Motors. Joseph Geschelin. *Automotive Industries,* v. 100, May 15, 1949, p. 26-28, 104.

Machine-shop methods and apparatus used for finishing the various parts, including Meehanite-iron flywheel and numerous Al-alloy precision die castings.

20A-234. Methods of Measurement in Machinability Research. O. E. Svahn. *Transactions, Instruments and Measurements Conference* (Stockholm), 1947, p. 123-128.

Methods used at Royal Swedish Institute of Technology, Stockholm, Sweden.

20A-235. Air Operation of Machines. *Machinery* (London), v. 74, May 12, 1949, p. 622-625.

Several applications to machine tools.

20A-236. Back to Cams Again. E. J.

Tangerman. *American Machinist,* v. 93, June 2, 1949, p. 105.

New Bryant internal automatic grinder stripped of all hydraulic and electronic devices. All elements are cam operated.

20A-237. Practical Ideas. *American Machinist,* v. 93, June 2, 1949, p. 112-116.

Includes the following: multiple-spindle drilling added to turret lathe (R. G. Dickens); depth-gage attachment scribes layout lines (Eugene Dietz); springs cushion worm shock (Chester S. Ricker); staggered construction improves magnetic blocks (Allan B. Nixon); drill-in-spindle setup pierces long stock (Michael P. Blake); drilling fixture speeds setup and location (E. C. Schlenker); pin holder aids sheet-metal layout (Gerhard Wenke); shearing punch deburrs cams (John K. Lukacs); double-bend tool turns casting trunnions (C. L. Bossmeyer); jig boring method improves accuracy on old machines (Norman A. Benson); and other miscellaneous shop hints.

20A-238. Horsepower for Turning and Boring With Carbide. *American Machinist,* v. 93, June 2, 1949, p. 127.

20A-239. Grinding With Formed or Multiple Wheels. J. F. Fischer. *Modern Machine Shop,* v. 22, June 1949, p. 98-102.

A number of the more important factors to be considered in the selection of a method.

20A-240. Modern Equipment at Work. *Modern Machine Shop,* v. 22, June 1949, p. 194, 196, 198, 200, 202, 204, 206, 208, 210.

Changes in hob design and manufacturing methods solve problem of noisy gears; Sundstrand Rigidmil for milling cylinder heads; valve body machined with Cincinnati boring mill, truck axles machined with LeMaire special machine; Airco No. 394 for welding mower blades.

20A-241. Ideas From Readers. *Modern Machine Shop,* v. 22, June 1949, p. 212, 214, 216, 218, 220, 222.

"Geared Collet Chuck", Clifford T. Bower; "Method of Reversing Hot Workpieces", B. A. Lee; "Bending Device for Small Parts", R. H. Dauterich; "Uses for Old Files", A. H. Waychoff; and "Versatile Indicator Holder", John C. Mottl, Jr.

20A-242. The Shaper as a Manufacturing Tool. J. J. Murphy. *Machinery,* v. 55, June 1949, p. 155-158.

Some examples of effective applications.

20A-243. How to Estimate Machining Costs in the Job Shop. Herbert W. Brown. *Machinery,* v. 55, June 1949, p. 159-164, 166.

First of a series that will cover all basic types of machine tools. A practical method of estimating the cost of planer jobs.

20A-244. Machining Sintered Powdered-Metal Bearing Materials. E. J. Weller. *Machinery,* v. 55, June 1949, p. 181-184.

Recommended procedures. Design of carbide-tipped tools for the operation.

20A-245. Production Jig Boring to Close Tolerances. George H. DeGroat. *Machinery,* v. 55, June 1949, p. 185-187.

Typical production job using a jig-boring machine. Shift from boring mill reduced time from 3½ hr. to 22 min. per piece.

20A-246. Tool Engineering Ideas. *Machinery,* v. 55, June 1949, p. 207-210.

"Simple Method of Making Die Shedders or Strippers", Cliff Bossmann; and "Indexing Drill Jig for Radial and Longitudinal Location", L. Kasper.

20A-247. Electromagnetic Clutches Simplify Machine Control. James A. Mason and L. A. Leifer. *Machine Design,* v. 21, June 1949, p. 107-110.

Turret lathe in which the above have produced a faster and safer semi-automatic machine tool.

20A-248. Toolroom Methods Can Increase Manufacturing Production. *Tool & Die Journal,* v. 15, June 1949, p. 90, 92.

Experience using Moore Panto-Crush Wheeldressers.

20A-249. Grinding Fine-Pitch Gears. A. S. Beam. *Journal of the American Society of Naval Engineers,* v. 61, May 1949, p. 464-468. Reprinted from *Machinery,* v. 55, Dec. 1948.

Previously abstracted from original, item 20a-449, 1948.

20A-250. Novel Facing Tool for Radial Drills. *Engineers' Digest,* v. 10, May 1949, p. 174. Translated and condensed from *Werkstatt und Betrieb,* v. 82, Jan. 1949, p. 13.

20A-251. Bigger and Better Spun Heads. *Lukens Plate,* v. 11, no. 1, [1949], p. 2-5.

276-in. flanging machine, at Lukens, capable of spinning heads in diameters up to 20 ft., 6 in.

20A-252. Duplicating Mechanisms for Lathes for Machining Surfaces of Non-Circular Form. (In Russian.) M. B. Tumarkin. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Feb. 1949, p. 7-12.

Factors to be considered in their design. Applications and optimum conditions of operation.

20A-253. Influence of Type of Grain and Binding Agent of the Abrasive Wheel on Grinding and Polishing of Metals. (In Russian.) N. I. Volskii. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Feb. 1949, p. 18-20.

Relative merits of corundum and carborundum as metal abrasives. Differences between them are explained on the basis of type and size of grains and of varying characteristics of the bonding agents.

20A-254. (Book) **Werkstattkniffe, Vorrichtungsbau.** (Workshop Hints, Jigs and Fixtures.) Hans E. Scheibe. 84 pages. Carl Hanser Verlag, Munich 27, Germany.

The author is a jig-and-fixtures designer of long standing. Examples are given of turning, drilling, milling, grinding, and indexing devices.

20A-255. (Book) **Machining of Metal.** Robert E. Smith. 224 pages. McKnight & McKnight, 109-111 W. Market St., Bloomington, Ill. $3.50.

Step-by-step instructions for the correct and safe operation of each machine, including tool grinders, drilling machines, lathes, shapers, milling machines, power hacksaws, metal-cutting band saws, and surface-grinding machines. Each section dealing with the various types of machines describes exactly how specific operations are performed.

20A-256. Helical Gears Cut on "Solid Table" Machines. No. II. Distribution and Amount of Errors. S. A. Couling. *Engineer,* v. 187, May 27, 1949, p. 580-582.

Action of the hob when cutting the teeth in gear-wheel blanks. Sources of error which must be controlled to fine tolerances.

20A-257. Solving Compound Angle Problems. Jay N. Edmondson. *Tool Engineer,* v. 22, June 1949, p. 21-22.

Problems of milling and drilling. Original design, graphical solution and design of mill fixture, calculated solutions for accurate location of pins and bushings.

20A-258. Machine Tool Selection in the Turning Field. E. L. Murray. *Tool Engineer,* v. 22, June 1949, p. 24-28.

Workpiece geometry, material, and accuracy, personnel factors, and total production.

20A-259. Output Trebled by Tooling Changes. A. E. Rylander. *Tool Engineer,* v. 22, June 1949, p. 29.

Redesign of window-regulator arms and its effect on manufacturing economy.

20A-260. Gang Milling Fixture. Robert Mawson. *Tool Engineer,* v. 22, June 1949, p. 35.

20A-261. Gadgets. *Tool Engineer,* v. 22, June 1949, p. 43-44.

"Punching Small Holes in Heavy Stock", Federico Strasser; "Holder for Reboring Washers", O. W. Anderson; "Chip Wiper for Carbide Cutters", A. S. Childs; "Drill and Tap Through One Bushing", Stanley R. Welling; and "Simple Cutter Grinder", Arthur R. Christensen.

20A-262. Hermes IV and Hastings. Part IV. Mainplane Construction and Assembly; Manufacture of Tail Surfaces. (Concluded.) S. C. Poulsen. *Aircraft Production,* v. 11, June 1949, p. 186-195.

Design of the mainplane units. Spar-boom machining and spar assembly, and the components are followed through to the later assembly stages. Tail-surface construction, and progress of the major units is traced through to final assembly.

20A-263. The Characteristics of Machined Surfaces. A. J. Chisholm. *Machinery* (London), v. 74, June 2, 1949, p. 729-736.

Factors affecting the roughness of cut surfaces produced by simple edge-cutting tools. Lubrication, surface deformation, and residual surface stresses.

20A-264. New Machines for Automotive Production. *Automotive Industries,* v. 100, June 15, 1949, p. 46-47, 64.

Several new honing machines.

20A-265. How to Choose and Use Portable Tools. Part 3. Selecting the Right Tool. H. P. Bailey. *American Machinist,* v. 93, June 16, 1949, p. 106-109.

Tools for the individual job without regard to the form of power supply used.

20A-266. Practical Ideas. *American Machinist,* v. 93, June 16, 1949, p. 111-116.

Includes the following: ball-supported toolholder follows piston-head cam (William Holmes); steadyrest jaws located before stock is chucked (Harold W. Cutting); reverse centers locate reamers for regrinding operations (Heinz Landauer); boring bar shifts diameter to cut tapered bore (Fred H. Lingenfelder); double-clamping fixture holds part for grinding (Paul H. Winter); shear blade ground on power table saw (Bernard Levowich); differential screws sharpen surface-gage accuracy (Carl S. Frank); drilling jig improves accuracy in working from layouts, prints (Allan B. Nixon); dimpled

tubing locates itself for soldering job (Henry George): and other miscellaneous shop hints.

20A-267. Diagnosis of Machining Troubles. I. Single-Point, Flat and Circular Forming Tools. II. Multiple-Point Rotating Tools. *American Machinist,* v. 93, June 16, 1949, p. 127, 129.

In charted form.

20A-268. Chart for Number of Boring Cuts; Boring-Tool Design for Turret-Lathe Operations. *American Machinist,* v. 93, June 16, 1949, p. 131.

Two ½-page items. Chart application and diagrams for cast iron, bronze, and steel.

20A-269. Automatic Operation, Greater Precision Feature Latest Honing Machines. *Steel,* v. 124, June 20, 1949, p. 118, 136.

Several new machines.

20A-270. End Forming Machine; Novel Variation of Centreless Principle. Arthur Scrivener. *Microtecnic* (English Edition), v. 3, Mar.-Apr. 1949, p. 91-93.

New type of machine which is a variation of the conventional centerless grinder for grinding end profiles of a certain range of shapes not readily handled by ordinary types.

20A-271. The Truing Devices of the Chatwood Hob and Helical Spline Grinder. *Industrial Diamond Review,* new ser., v. 9, May 1949, p. 148-150.

20A-272. Added Thread Rolling Operation Produces Part Complete on One Machine. *Screw Machine Engineering,* v. 10, June 1949, p. 34-36, 38.

Method makes possible completion of part on one 1⅝-in. RB-6 spindle Acme-Gridley multiple-bar machine in 23.6 seconds.

20A-273. Turret Lathe Practice. E. L. Marray. *Screw Machine Engineering,* v. 10, June 1949, p. 39-44.

Two basic methods, forming and generating with single point tools, for machining tapered surfaces, contours with simple curves, or a combination of both on the hand-turret lathe.

20A-274. Increase Production on Chucking Job With Automatic Loading and Ejection. *Screw Machine Engineering,* v. 10, June 1949, p. 46-49.

Fabrication procedure for valve. Part is loaded into chuck using a manually loaded cross-slide magazine.

20A-275. Corrected Diameter Tables of 10-Degree Top-Rake Circular Tools for No. 2G Brown & Sharpe Automatics. Roy M. Spaulding. *Screw Machine Engineering,* v. 10, June 1949, p. 50-57.

20A-276. Stock Ends. *Screw Machine Engineering,* v. 10, June 1949, p. 59.

"T-Slot Cleaner", Donald E. Wood; and "Slotting Problems", George Schrader.

20A-277. Centreless Grinding of Headed Pieces. *Aircraft Engineering,* v. 21, June 1949, p. 201.

How a monotonous operation may be eliminated and production increased by use of an automatic machine.

20A-278. Duplicating Equipment Builds Supersonic Models. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, June 1949, p. 66-69, 106.

Equipment and procedures for production of highly precise wind-tunnel models.

20A-279. New Developments in Microhoning. Part I. The Process. Pat Qualtieri. *Western Machinery and Steel World,* v. 40, June 1949, p. 80-83, 106.

Process makes use of abrasive grit to shear stock from the surface processed. The way in which the grit is applied to the surface and the cutting action of the grit are said to be entirely different from those of grinding and lapping.

20A-280. Motor Drive and Speed Control for Machine Tools. Georg Schlesinger. *Machinery* (London), v. 74, June 9, 1949, p. 766-771.

Including calculation of effective cutting powers.

20A-281. Milling Supercharger Bucket Blades From Bar Stock. S. B. Fuerst. *Iron Age,* v. 163, June 23, 1949, p. 60-64.

Manufacturing sequence, inspection methods, tolerances, and production speeds, as well as some of the unusual machine setups.

20A-282. Grinder Produces Fine Flat Surfaces. H. F. Skillings. *American Machinist,* v. 93, June 30, 1949, p. 74-76.

Optically flat surfaces with low micro-inch finishes can be obtained with standard vertical-spindle surface grinders by proper wheel selection and technique.

20A-283. Practical Ideas. *American Machinist,* v. 93, June 30, 1949, p. 101-106.

Disappearing roller thread ground with off-pitch passes (G. Starre); lathe mills face cam with spring-loaded templet (Heinz M. Landauer); corner-grinding troubles avoided with sectional punch (Cliff Bossman); eccentric cutter mounting provides various radii (W. Francis); cylinder holds wash-

ers for multiple boring (O. W. Anderson); jig holds nuts for edge drilling (T. W. V. Morgan); crane bearing re-centered in crankshaft sleeve (Peter Cervelli); radius cut on planer with one head rotating the other (Edward Farrell); hardened buttons grip sides of drafted parts (Fred H. Lingenfelder); shaper rolls trade marks (Bernard Levowich); air-compressor switch has fast leveling action (Dennis D. Unruh); roller block locates castings (Robert Mery and Victor A. Ritz); milling tool locates, steadies, and separates flat stock (H. Moore); and other miscellaneous shop hints.

20A-284. Turret-Lathe Machining Times. *American Machinist,* v. 93, June 30, 1949, p. 117, 119, 121.

Three "Reference Book Sheets" consist of (1) "s.f.p.m. chart" for cutting of 13 ferrous and nonferrous materials with cemented carbide and nine with high-speed steel; (2) a feed-per-revolution chart for the same materials; and (3) a nomographic carbide vs. high-speed steel selection chart.

20A-285. How Link-Belt Produces Ball and Roller Bearings. D. I. Brown. *Iron Age,* v. 163, June 30, 1949, p. 58-63.

Methods and equipment. Manufacturing procedures for making various types of solid and split-bearing mounts and pillow blocks. Machine-shop operations and inspection procedures.

20A-286. Modern Equipment at Work. *Modern Machine Shop,* v. 22, July 1949, p. 184-186, 188, 190, 192, 194, 196.

Lathe converted to automatic by installation of automat; cylinder blocks processed in special-purpose machine; new technique applied to welding of 4-6% Cr pipe; circular form tools used for cutting grooves in bronze seals; and rotating carrier for handling coils of wire.

20A-287. Ideas From Readers. *Modern Machine Shop,* v. 22, July 1949, p. 198-200, 202-204, 206-207.

Height or surface gage and an interesting application to check crankshafts, H. C. Urbauer; device to hold short, cylindrical workpieces, A. H. Saychoff; contour milling arrangement, Aaron H. Shum.

20A-288. Converting Machines to the Use of Carbides. *Iron Age,* v. 164, July 7, 1949, p. 89.

Conversion of a 31-year-old planer type miller. Operating results.

20A-289. How to Choose and Use Portable Tools. Part 5. Selecting the Power Supply. H. P. Bailey. *American Machinist,* v. 93, July 14, 1949, p. 120-123.

Described and illustrated.

20A-290. Practical Ideas. *American Machinist,* v. 93, July 14, 1949, p. 124-128.

Includes the following: angled forming toolbit slices parts without chatter (J. A. Waller); sphere-turner features quick radius adjustment (R. B. Wolverhampton); weld button cuts brittleness (G. C. Farrington); stepped templet gage centers holder for edge-turning (F. G. Forquer); reciprocating tool in adapter cuts radii on shaper (Victor Melendez); carbide tool-bit pressed into steel shank (Roger Vicaire); and other miscellaneous shop hints.

20A-291. Mechanics of Formation of the Discontinuous Chip in Metal Cutting. Michael Field and M. E. Merchant. *Transactions of the American Society of Mechanical Engineers,* v. 71, July 1949, p. 421-428; discussion, p. 428-430.

Geometry, mechanics of formation, and plasticity conditions for the "continuous" type of chip have previously been analyzed in detail. Formulates a similar analysis for the "discontinuous" type of chip. 10 ref.

20A-292. Form-Grinding of Internal Surfaces. G. H. De Groat and P. J. Koelbel. *Machinery* (London), v. 74, June 16, 1949, p. 807-809.

Improved method used by J. & S. Tool Co., in the U. S., which results in greater accuracy in grinding internal tangential forms.

20A-293. Air-Operated Chucking Devices for Lathe Applications. Harry L. Stewart. *Product Engineering,* v. 20, July 1949, p. 128-129.

The universal power chuck, compensating air chuck, air-operated chuck and tail stock, collet-type chuck, mandrel-type chuck, and double-jaw mandrel chuck.

20A-294. New Principle Improves Abrasive Belt Grinding. *Production Engineering & Management,* v. 24, July 1949, p. 44-46.

An integral roll grinder incorporates a new grinding principle. An abrasive belt traversing a master roll is used to achieve exceptional accuracy with fine surface finish.

20A-295. The Machining of the Dynaflow Transmission. Fred C. Pyper and A. G. Mac Dougall. *Machine and Tool Blue Book,* v. 45, July 1949, p. 63-68, 70, 72, 74, 76, 78, 80.

The above has a total of 354 different parts, most of them machined

to close tolerances. Interesting machining problems.

20A-296. New Face Grinder Employs Unusual Principle. William F. Schleicher. *Machine and Tool Blue Book,* v. 45, July 1949, p. 97-100, 105-106.

A special grinding head gives compound movement from one bearing and permits loading of one station while grinding on another.

20A-297. The Use of Inclinable Punch Presses. (Continued.) J. I. Karash. *Tool & Die Journal,* v. 15, July 1949, p. 46-48, 50.

The inclined press, basic types of materials and press operation, die design for inclinable presses, and multiple-bar exposed knock-out.

20A-298. Gorton No. 2-28B Horizontal Mill Features Extreme Rigidity and Power. *Tool & Die Journal,* v. 15, July 1949, p. 52-53, 55.

The above milling machine and its operation for heavy-duty production work.

20A-299. New Low-Priced Cylindrical Precision Grinder. *Tool & Die Journal,* v. 15, July 1949, p. 62.

A simple, flexible cylindrical grinder which can be used for small-lot manufacturing purposes in small or large shops and toolrooms.

20A-300. The Evolution of Machine Tools. A Plea for Simplicity. James F. Driver. *Machinery Lloyd* (Overseas Edition), v. 21, June 18, 1949, p. 86-93.

Position of cutting tools, bearings, future developments, machine and workpiece, and roughing and finishing.

20A-301. A Versatile Universal Grinding Machine. *Machinery Lloyd* (Overseas Edition), v. 21, June 18, 1949, p. 94-99.

The Jones and Shipman hydraulic grinding machine, model 1001, its controls and operation.

20A-302. Internal Resonance. One of the Principal Causes of Machining Vibrations. L. B. Ehrlich. *Engineers' Digest,* v. 10, June 1949, p. 201-202. Translated and condensed from *Stanki i Instrument* (Machine Tools and Instruments), No. 1, 1949, p. 20-22.

Mathematical analysis of the above.

20A-303. Monarch Template-Controlled Roll Turning Lathe. *Machinery* (London), v. 74, June 23, 1949, p. 842-843.

Advantages of the machine.

20A-304. Finroc Gear Shaving Machines for Large Spur and Helical Gears. *Machinery* (London), v. 74, June 23, 1949, p. 859-861.

New method for finishing straight spur and single and double helical gears, which removes completely undulations formed in helical gear teeth cut by the hobbing process, and is claimed to result in a greater degree of correction in errors of profile, pitch, helix angle, and surface finish.

20A-305. Errors of Single-Start Hobs for Involute Gears as Used in Precision Instruments and Their Influence on the Generated Tooth Shape. Herbert Göttsching. *Microtecnic.* (English Edition), v. 3, Mar.-Apr. 1949, p. 72-78. Translated from the German.

Detailed analysis, illustrated by diagrams. (To be continued.)

20A-306. (Book). **Technical Metalcraft for Schools.** J. R. Ferguson. 92 pages. B. T. Batsford, Ltd., 15 North Audley St., London, W. 1, England. 7s, 6d. net.

The first four chapters deal with measuring and marking out, hand-tool operations, heat treatment of carbon steel, and machine-tool operation (drilling, turning, and shaping). The fifth and final chapter contains 20 practical exercises for bench and machine tool work in a graduated sequence of practical complexity, with detail and assembly drawings.

20A-307. Two-Component Dynamometers for Determination of Forces of Grinding. (In Russian.) M. I. Babchinitser. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Mar. 1949, p. 22-24.

Devices designed to determine tangential and radial forces simultaneously during mechanical grinding.

20A-308. Turning Commutators With Diamond Tools. J. B. Leece. *Industrial Diamond Review,* new ser., v. 9, June 1949, p. 165.

Small commutators (¾ in. diam. by ⅜ in. long) were turned using sintered carbide tools, but the costs were very high. After development of diamond tools, costs were cut and the commutators per tool increased from 200 to 10,000-40,000.

20A-309. Die Sinking for Drop Forging. Part III. Cutting Tools. John Mueller. *Steel Processing,* v. 35, June 1949, p. 301-305.

The variety of tools commercially available for machining or hand cutting hardened die blocks. Power machinery, abrasive wheels of various designs, polishing heads, files, boring heads, die-sinking machine cutters and "boss cutters", junior milling tools, and power machinery.

20A-310. The Utilization of Obsolete Lathes. P. E. Crome. *Machinery* (London), v. 74, June 30, 1949, p. 881-882.

20A-311. Bent Shank Tap Applied to Multiple Spindle Automatic. *Screw Machine Engineering,* v. 10, July 1949, p. 23-26.

Procedure for tooling steel hex nuts at the rate of 7200 gross pieces per hour, accomplished by removing feed gears and operating the automatic with the high-speed clutch engaged at all times.

20A-312. Chucking Automatic Successfully Produces Complex Part. *Screw Machine Engineering,* v. 10, July 1949, p. 28-31.

An eight-spindle automatic chucking machine. Advantages of taking multiple cuts in seven work stations with only one chucking of the part.

20A-313. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, July 1949, p. 32-38.

"Tricks of the Trade" which add to successful turret-lathe operation.

20A-314. Pitfalls to Avoid in Tooling Screw Machines. XI. Noel Brindle. *Screw Machine Engineering,* v. 10, July 1949, p. 39-44.

More common knurling operations. Limitations on knurl widths and the effect of knurling on operation sequence.

20A-315. South Bend No. 2-H Turret Lathe. *Screw Machine Engineering,* v. 10, July 1949, p. 45-47.

The above has been redesigned.

20A-316. Tool Engineering Ideas. *Machinery,* v. 55, July 1949, p. 213-215.

"Boring Fixture That Eliminates Need for Scraping Operation", Robert Mawson; "Locking Wedges Reduce Die Breakage in Hardening", P. E. Redgrave; "Quick-Acting Toolmaker's Vise", Clifford T. Bower; and "Carbide Tools Last Longer in Piano Manufacture".

20A-317. Rubber Hydraulic Tooling. *Aircraft Production,* v. 11, July 1949, p. 215-217.

Several applications of the expanding principle to production equipment. Several types of mandrel employing the principle have been developed. Applications include gear grinding, fine boring. Method of manufacture of the mandrels is also outlined.

20A-318. Complete Package Grinding. James Blane. *Western Machinery and Steel World,* v. 40, July 1949, p. 64-67.

Custom-grinding shop.

20A-319. Precision Hinges for Aircraft. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, July 1949, p. 72-75.

Unusual machine-shop equipment and procedures used in their manufacture.

20A-320. Shop Kinks. *Western Machinery and Steel World,* v. 40, July 1949, p. 99.

Die-maker's square, drill block, and ball drilling holder.

20A-321. Computing Torque, Thrust and Horsepower for Counterbores. G. F. Bush. *Tool Engineer,* v. 23, July 1949, p. 23-25.

As a result of a comprehensive series of tests, basic data required to compute the above were obtained. The studies were designed to show the relationship between torque, thrust and horsepower and diameter of the counterbore; diameter of the pilot; number of teeth; feed; speed; and material cut.

20A-322. Milling Cutter Design and Operation. (Concluded.) Mario Martellotti. *Tool Engineer,* v. 23, July 1949, p. 34-37.

Deals with oblique or true rake angle (a combination of radial, axial, and corner angle), and clearance angle (primary and secondary), also their selection and measurement. Values of oblique rake angle in face mills having 15, 30, and 45° chamfer angles; and clearance angles for various worked materials.

20A-323. Gadgets. *Tool Engineer,* v. 23, July 1949, p. 46-47.

"A 'Converted' Threading Tool", Arthur R. Christensen; "Hex Wrench Makes Handy Tool", Roger Isetts; "Quick Acting Drill Jig", Stanley R. Welling; "To Align Punches and Dies", John Turvene; "Simple Straddle Milling Fixture", Robert Mawson; "Redesigned Drill Adds Tool Life", Alex J. Precoda; and "To Determine Center of Gravity", Federico Strasser.

20A-324. Cutting Tubular Stock by the Bandsaw Method. H. J. Chamberland. *Western Metals,* v. 7, July 1949, p. 25-27.

20A-325. Metal Cutting and Machine Shop Productivity: Factors Determining Cutting Forces and Tool Wear; The Causes of Chatter Vibrations. A. J. Chisholm. *Machinery* (London), v. 75, July 7, 1949, p. 10-15; July 14, 1949, p. 51-53.

First article of the series (June issue) presented a general study of the characteristics of machined surfaces and of lubrication in the cutting process. Cutting forces, tool wear, and chatter vibrations are now considered, the latter in the concluding installment.

20A-326. Taper Milling Aircraft Parts. A. C. Slatter and J. J. Sloan. *Iron Age,* v. 164, July 14, 1949, p. 92-95.

Developed for contouring wing skins for high speed aircraft, and

now being used for step and taper milling of spar webs, fuselage skins, and other structural members requiring thick edges, steps, straight tapers, or islands. Machining methods and design factors.

20A-327. Machine Shop Operations on Land-Rover Components. *Machinery* (London), v. 75, July 14, 1949, p. 39-47.

Third of a series of articles giving details of production of British agricultural and industrial vehicle.

20A-328. Drive Requirements of Machine Tools. Georg Schlesinger. *Machinery* (London), v. 75, July 14, 1949, p. 48-50.

As applied to drilling machines; milling machines; presses; and forging machines.

20A-329. Simple Equation Gives Machinability Values. James Sorenson and Marlowe Peters. *American Machinist,* v. 93, July 28, 1949, p. 95-96.

Formula based on many shop tests by means of which relative machinability of SAE steels using 18-4-1 high-speed tools can be determined quickly. Constants for the different SAE steels in different conditions.

20A-330. Sight At Your Fingertips. *American Machinist,* v. 93, July 28, 1949, p. 100-101.

Some simple, mechanical aids which provide new horizons for the blind technician and make it possible for him to do even "close" machineshop jobs accurately.

20A-331. Practical Ideas. *American Machinist,* v. 93, July 28, 1949, p. 102-106.

Includes the following: universal holder locks many tap sizes in turret lathe (R. B. Wolverhampton); tool align lathe bit for turning chamfers (Robert N. Adams); chuck swings boring toolbit in heavy, braced holder (Roy L. Derosia); press tool bends tubing (F. E. Riley); cutter rig on engine lathe bores long tubes smoothly (Fred H. Lingenfelder); layout tool can be used with precision gage blocks (Allan B. Nixon); simple torque wrench made from scrap-steel parts (Gerhard Wenke); hand-gun drill mills curved, irregular slots (Dan Penway); two toolposts double cutting power (Lyle C. Vinger); micrometer tool puts old measuring head to use (S. Framurz); double-flange winding arbor finishes heavy springs on lathe (J. R. Paquin); and other miscellaneous shop hints.

20A-332. Threading Speeds for Various Materials. *American Machinist,* v. 93, July 28, 1949, p. 117.

National coarse threads and the National fine series for various steels, irons, nonferrous metals and alloys, fiber, and bakelite.

20A-333. Taper Skin Milling—A New Machining Technique. A. C. Slatter and J. J. Sloan. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 30-32, 62.

As applied to save weight by distributing the mass of metal where it is required to carry the load. Advantages and disadvantages.

20A-334. The Design and Construction of a 14-Ft. Gear Hobbing Machine. B. Barback. *Transactions of the Institution of Engineers and Shipbuilders in Scotland,* v. 91, 1948, p. 15-46; discussion p. 46-67.

20A-335. A New Trimming Fixture for Deep-Drawn Parts. H. Schlick. *Engineers' Digest,* v. 10, July 1949, p. 250. Translated and condensed from *Werkstatt und Betrieb,* v. 82, Feb. 1949, p. 58.

20A-336. The Production of Automatic Record Changers. *Machinery* (London), v. 75, July 21, 1949, p. 75-82.

Machine-shop equipment and procedures.

20A-337. A Light Articulated Radial Drilling Attachment. *Machinery* (London), v. 75, July 21, 1949, p. 82.

20A-338. Thread Rolling with Swing-Type Two Roll Knurl Holder. *Screw Machine Engineering,* v. 10, Aug. 1949, p. 23-27.

Relatively simple screw-machine part. Alternate method for producing this part on the screw machine. Details of recommended setups. The success of the method adopted is attributed to the method of rolling the thread. Using two thread rolls, presented to the work in such a manner that pressure is equalized, eliminates the problem of supporting the work.

20A-339. Water Soluble Coolant—A Good Lubricant, Too! Ralph Hause. *Screw Machine Engineering,* v. 10, Aug. 1949, p. 29-30.

A case in which a water soluble coolant was found to be satisfactory for both cutting and lubricating purposes. Despite apparent success, use of this coolant as a lubricant entailed additional maintenance costs on machines. Added maintenance expense is more than offset by the savings realized in oil costs.

20A-340. New Cone Automatic Machine Tool Developments. *Screw Machine Engineering,* v. 10, Aug. 1949, p. 31-35.

Details of construction of new S1, 1-in., 6-spindle "Conomatic" machine.

20A-341. Locating and Chucking Meth-

ods Solve Concentricity Problem. *Screw Machine Engineering,* v. 10, Aug. 1949, p. 38-41.

Set-ups for production of piece in which concentricity between two bored surfaces inside the bole end is required to be within ±0.005-in. to the 0.6245-in. reamed hole. On this part, the gaging points are 9 in. apart and the amount of eccentricity multiplies greatly as distance between the two surfaces increases.

20A-342. Business Machines Produced by Modern Methods. W. C. Pfeiffer, *Machinery,* v. 55, Aug. 1949, p. 139-146.

A variety of machine-shop and press operations in production of miscellaneous small parts for bookkeeping, accounting, calculating, and statistical machines.

20A-343. How to Estimate Costs of Shaper Jobs. Herbert W. Brown. *Machinery,* v. 55, Aug. 1949, p. 152-156.

Second in a series of articles on estimating machining costs in the job shop.

20A-344. Instruction Chart Simplifies Grinding of Milling Cutters. Hans A. Branders. *Machinery,* v. 55, Aug. 1949, p. 164.

Purpose of charts is to reduce the expense of grinding and sharpening carbide-tipped milling cutters and also to make possible use of unskilled labor for this work.

20A-345. Tool Engineering Ideas. *Machinery,* v. 55, Aug. 1949, p. 171-173.

"Simple Fixtures that Facilitate Crankshaft Inspection", H. C. Urbauer; "Modified Product Design Permits Simplified Grinding Set-Up", F. H. Mayoh; "Internal Spot-Facing Tool with Convenient Cutter Adjustment", H. Moore.

20A-346. Ideas From Readers. *Modern Machine Shop,* v. 22, Aug. 1949, p. 166, 168-170, 172-173.

"Fixture for Chucking Threaded Workpieces", John F. Nelson; "An Inexpensive Tapping Fixture", Robert Mawson; "Modified Reamer for Machining Steel Ram Rods", E. R. Yarham; and "V-Notches Improve Tin Snips", A. H. Waychoff.

20A-347. Product Design and Its Relation to Milling Cutter and Machine Selection. Mario Martellotti. *Tool Engineer,* v. 23, Aug. 1949, p. 17-20.

Characteristic features of available milling machines of standard design, and operating characteristics of milling cutters in terms of their metal-removal ability. Factors which influence fixture design and its cost.

20A-348. Current Trends in Cutting Fluids. James McElgin. *Tool Engineer,* v. 23, Aug. 1949, p. 23-24.

History and development. Development and use of bases soluble in both water and oil.

20A-349. Gadgets. *Tool Engineer,* v. 23, Aug. 1949, p. 44-45.

"Rubber Protects Finish", Roger Isetts; "Limit Switches Protect Planer Crossrail Lifting Mechanism", Geo. W. Brown; "Work Holding Methods", Federico Strasser; "Ejector for Punch Press", A. C. Good; "Salvaging Carbide Inserts", Stanley R. Welling; "Ratchet Wrench for Socket Screws", George Hull; and "Adjustable Height Block", J. P. Paquin.

20A-350. Direct Contour Milling. *Aircraft Production,* v. 11, Aug. 1949, p. 264-266.

Design and capabilities of the Kearney and Trecker Milwaukee 2D rotary-head milling machine.

20A-351. Developments in Gear Production. Investigation of Hob-Cutting and Worm-Grinding Processes, Crossed-Axis Shaving. H. Pearson. *Aircraft Production,* v. 11, Aug. 1949, p. 267-271.

Presents results of experimental investigation. Many of the developments described have been introduced into production departments, with resulting savings and improved quality of work.

20A-352. Some Ordinary and Some Unusual Broaching Operations. William F. Schleicher. *Machine and Tool Blue Book,* v. 45, Aug. 1949, p. 84-86, 88, 90, 92.

Some of the work of the Illinois Broach and Machine Co., including both ordinary and unusual operations.

20A-353. Fast, Economical Jig Grinding Possible With New Attachment. J. L. McLaughlin. *Machine and Tool Blue Book,* v. 45, Aug. 1949, p. 95-96, 101-102, 104.

Holes can be located and ground in an average of 15 min. rather than 2-3 hrs. Correction for size and location of holes in hardened components is now possible.

20A-354. Cutting Speeds. *Production Engineering & Management,* v. 24, Aug. 1949, p. 67.

Suggested cutting speed ranges for five cutting-tool metals operating on a variety of ferrous and nonferrous metals and alloys.

20A-355. Tooth Finishing With Modified Gear Shaper Cutters. Guy Hubbard. *Steel,* v. 125, Aug. 1, 1949, p. 80, 106.

Helicoidal-type cutting teeth, set at an angle to the work, which remove metal in the form of fine

chips and produce either spur or helical gears with a high degree of accuracy.

20A-356. Gear Finisher Employs New Principle. *Iron Age,* v. 164, Aug. 4, 1949, p. 89.

New development in finishing spur and helical gears. Cutters, set at an angle relative to the work, have teeth of helicoidal shape and are sharpened by face grinding. An advantage is ability to cut freely with no burnishing effect on the work. Both sides of the gear teeth are finished on one traverse.

20A-357. How Do Speed and Feed Affect Tool Life? Thomas Badger. *American Machinist,* v. 93, Aug. 11, 1949, p. 89-92.

Speed-feed charts for determining the most effective cutting conditions for cast-alloy lathe tools plus detailed explanation of their use.

20A-358. Crossbreed Machine Tools May Solve Jet Jobs. E. J. Tangerman. *American Machinist,* v. 93, Aug. 11, 1949, p. 96-97.

Problems of machining the pine-tree form on aircraft gas-turbine blades and wheels, and of precision drilling and turning concentric rings. Use of inserted-tooth broach. Teeth may be ground and backed off to any desired shape or rake, and require a spacing of ¾ in. or more, allowing plenty of chip clearance.

20A-359. More On Files. D. L. Leslie. *American Machinist,* v. 93, Aug. 11, 1949, p. 113.

Comments critically on "How to Choose and Use Files", by Grant Loader. (May 5 issue.)

20A-360. How to Choose and Use Portable Tools. Part 7. Air Power Distribution. H. P. Bailey. *American Machinist,* v. 93, Aug. 11, 1949, p. 114-117.

Troubles due to the compressed-air system, and their remedies.

20A-361. Meter Miniatures From Model Tooling. Harry C. Baldwin. *American Machinist,* v. 93, Aug. 11, 1949, p. 122-123.

Bench-lathe production of small meter parts by Sangamo Electric Co. In addition to economical motion expenditures, such extra touches as unusual carbide tooling, tandem mounting of power and control cylinders, and air gaging have made precision production both more speedy and more accurate.

20A-362. Practical Ideas. *American Machinist,* v. 93, Aug. 11, 1949, p. 124-128.

Describes the following: Timber Templet Guides Feedscrew for Large Taper-Turning Job (Michael P. Blake); Locknut and Collar Adapt Gage for Hidden Bore (Charles Schwartz); Combination-Square Device Locates Tools on Automatics (Donald E. Wood); Hollow Mill for Special Job Made from Acorn Die (Otto V. Howe); Three Inspection Tools Are Samples of Inexpensive Gages (R. H. Fry); Machine-Table Vise Can Align Parts in Any Position (Allan B. Nixon); Depth Measurement with Balls Checks Conical Hole (Ray Cafiero); Double-Pin Gage Center Shafts (W. A. Maring); Quick-Clutching Attachment Speeds Lathe Tapping (Lowell F. Stull); V-Block with Slanted Cut Indexes Work at Common Angles (S. Framurz); Tack-Welding Method Aligns Shaft for Right-Angle Keyways (A. A. Sinisi); and other miscellaneous shop hints.

20A-363. Contour Grinding with Crush-Dressed Wheels. J. C. Wilson and Frederick G. Krafft. *American Machinist,* v. 93, Aug. 11, 1949, p. 139, 141.

Recommendations. Rate of crushing-roll wear for different materials and selection of wheels for crush dressing.

20A-364. Chip Breakers for Carbide Tools. *American Machinist,* v. 93, Aug. 11, 1949, p. 143. From "Tool Manual", published by Carboloy Co.

20A-365. Turn Miller: A New Machine for a New Process. Roger W. Bolz. *Machine Design,* v. 21, Aug. 1949, p. 90-94.

Turn milling is defined as the generation of circular or cylindrical surfaces with a rotating milling cutter. Application to machining of crankshafts and similar parts where checking as well as turning is necessary.

20A-366. New Developments in Microhoning. Part II. Microhoning Equipment. Pat Qualtieri. *Western Machinery and Steel World,* v. 40, July 1949, p. 78-81, 100.

Properties and selection of abrasives and coolants. (To be concluded.)

20A-367. Scrapers Made With Carbide Tool Tips. *Iron Age,* v. 164, Aug. 25, 1949, p. 75.

Used for reconditioning and original finishing of machine tool slides, bearing, lathe ways, and other machine applications. Standard Carboloy cemented-carbide blanks can be brazed to old files, both round and flat, then ground by hand to desired shapes. These improved scrapers lasted many times longer than those formerly used.

20A-368. Micro Tools Drill Tiny Holes.

J. A. Cupler, II. *American Machinist,* v. 93, Aug. 25, 1949, p. 76-78.

Equipment and procedures for precision drilling of extremely small holes with little or no drill breakage. Key to the process lies in continuous reciprocation of the drill point, lifting it clear of the work every few seconds, and in use of relatively low drilling speeds. As an example of possibilities, 7000 holes were drilled through 0.040-in. alloy steel with a single 0.0062-in. drill without breakage.

20A-369. Practical Ideas. *American Machinist,* v. 93, Aug. 25, 1949, p. 105-110.

Includes the following: table of cam dimensions simplifies jig and fixture design (Robert Mery); regrindable socket gage checks inserted-tooth saws (George W. Brown); jig plate and blanks clamped in shaper vise (R. A. Lackmann); drill fixture clamps diminutive parts (H. Moore); emergency surface gage proves a valuable tool (H. C. Urbauer); tension spring substitutes for flat spring trip (Alfred Rheingold); caliper-indicator gages replace large micrometers (Michael P. Blake); machinists-scale adapters measure lengths to a thousandth (Rex Smith); hot drilling saves die steel (H. Boranini); small magnets replace tacks and tape on bulletin boards (Arthur A. Merry); chatter buster backs up rifle-turning tool (Don J. W. Tibbits); swing recessing tool converted for knurling (Otto V. Howe); hollow mill cuts spheres (Walter G. Holmes); spring toolpost handles wide forming cuts (F. E. Riley); boring-cutter setup eliminates angle slotting (Lewis Welch); and other miscellaneous shop hints.

20A-370. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Aug. 1949, p. 42-47.

How to determine when it is necessary to apply standard, special, or combinations of both types of tools to a turret lathe setup. Examples of actual jobs.

20A-371. The Production of Motors for Radiograms; Methods Employed by the Garrard Engineering and Mfg. Co., Ltd. *Machinery* (London), v. 75, July 28, 1949, p. 111-118.

Machine-shop and blanking equipment used for production of phonograph motors.

20A-372. Mandrels for Quantity Production. Albert Maier. *Machinery* (London), v. 75, Aug. 4, 1949, p. 156-158.

In the tool-room, mandrels are often used where surfaces must be machined concentric with previously finished bores. Two forms are in common use. One is ground to a small taper, while the other comprises an accurately machined screw and nut. Such mandrels are not generally favored for quantity production on account of the time required for loading and risk of damage by unskilled labor. Different designs developed to overcome these objections.

20A-373. New Developments in Microhoning. Part III. Fixtures & Machines. Pat Qualtieri. *Western Machinery and Steel World,* v. 40, Aug. 1949, p. 82-84.

Requirements of microhoning equipment and technique; size control; characteristics and types of microhoning machines.

20A-374. Swiss Machine Tools; A Review of Modern Practice and Design. *Automobile Engineer,* v. 39, Aug. 1949, p. 320-323.

20A-375. Plugging Cylinder Liner Core Holes. *Iron Age,* v. 164, Sept. 1, 1949, p. 76.

How core drilling, tapping, and driving 1-in. pipe plugs in diesel-engine cylinder liners is done on a 3-way, 4-station, hand-indexing machine.

20A-376. Increased Production Through Better Use of Cutting Fluids. William H. Oldacre. *Tool & Die Journal,* v. 15, Sept. 1949, p. 62, 64, 66, 69.

Mechanisms of metal cutting and lubrication. Possibilities of large improvements.

20A-377. Hydraulic Chucking Devices for Lathe Applications. Harry L. Stewart. *Product Engineering,* v. 20, Sept. 1949, p. 124-125.

Details of various types.

20A-378. Contour Grinding 4000 Parts Per Hour. *Steel,* v. 125, Sept. 5, 1949, p. 112.

Mass production of simple or intricate contours in small metal parts by a crush-grinding machine with automatic control.

20A-379. Building Metering Pumps. Fred W. Vogel. *Modern Machine Shop,* v. 22, Sept. 1949, p. 98-102, 104, 106-107.

Machine-shop procedures and equipment in production of rayon-metering pumps.

20A-380. Carbide Tooling at New York Naval Shipyard. J. G. Kenney. *Modern Machine Shop,* v. 22, Sept. 1949, p. 110-114, 116, 118, 120, 122.

Program for coordinated carbide control which enabled the New York Naval Shipyard to speed up production as much as 400% on some types of work.

20A-381. New Machine Shop at Gulf Research Laboratories. *Modern Machine Shop,* v. 22, Sept. 1949, p. 160-162,

164, 166, 168, 170, 172, 174.

Specialized metalworking facilities which serve large-scale experimental and related programs.

20A-382. Modern Equipment at Work. *Modern Machine Shop,* v. 22, Sept. 1949, p. 206, 208, 210, 212, 214, 216, 218, 220, 222.

Consists of the following brief articles: Machining 22-Ton Diesel Crankshaft Sections; Sheffield Precisionaire for Gaging Cylinder Block Bores; Use of Portable Power Tools Reduces Assembly Costs; Thin-Walled Aluminum Castings Are Machined by Broaching; Savings From One Order Pays for Scully-Jones Automatic Recessing Tool.

20A-383. Ideas From Readers. *Modern Machine Shop,* v. 22, Sept. 1949, p. 224, 226, 228, 230, 232.

Consists of the following: "Cam Milling Fixture", Aaron H. Shum; "Handy Indicator Attachments", Edward Diskavich; "A Method of Indicating Gear Accuracy", Hartingh W. Babcock; and "Drafting Instruments Altered to Provide Easier Inking", A. H. Waychoff.

20A-384. How Buick Tools up for Small Part Production. B. S. Larzelere. *Iron Age,* v. 164, Sept. 8, 1949, p. 87-90.

Techniques employed in broaching, centerless grinding, burring, staking, and other operations in small-part production.

20A-385. Shop Shots at IBM. *American Machinist,* v. 93, Sept. 8, 1949, p. 96-97.

Miscellaneous machine-shop equipment and procedures in manufacture of IBM equipment.

20A-386. Practical Ideas. *American Machinist,* v. 93, Sept. 8, 1949, p. 124-128.

Includes the following: drillpress and bench lathe combined into jig borer (Lowell F. Stull); taper locating pins shift to release welded assemblies (H. G. Frommer); stepped plug and shims help pre-set steady-rest jaws (Ray Cafiero); shop-built angle dresser features dove-tailed slide (Allan B. Nixon); set of riser clamps simplifies milling setups (Allan B. Nixon); taper adapter holds part and micrometer for measurements (Stanley R. Welling); knife-edged web locates centerpunch on layout (R. A. Lachmann); combination tool cuts off and turns (H. G. Frommer); and other miscellaneous shop hints.

20A-387. Helical Gears Cut on "Solid Table" Machines. No. III. Distribution and Amount of Errors. S. A. Couling. *Engineer,* v. 188, Aug. 12, 1949, p. 176-178.

A further source of error in gear cutting and a new machine, recently installed, which was designed to overcome the various errors as far as possible.

20A-388. Practical Cutting Tools. J. M. Lickley and A. J. Chisholm. *Machinery* (London), v. 75, Aug. 18, 1949, p. 222-229.

Previous articles dealt with the mechanism of the simplest cutting operations, namely, orthogonal and oblique cutting with wedge-shaped tools. There is considerable evidence for believing that, fundamentally, all cutting operations are based on the action of simple wedge-shaped tools. Cutting forces, surface finish, and tool wear in relation to practical operations.

20A-389. Grinding a Shallow Profile; a Description of a Trigonometrical Method. H. J. Pearson. *Machinery* (London), v. 75, Aug. 18, 1949, p. 230-232.

Method applicable where specialized equipment such as an optical profile grinder or template-controlled diamond truing device is not available.

20A-390. Electronic Control of Machine Tools. S. A. Ghalib. *Engineering,* v. 168, Aug. 19, 1949, p. 173-174. A condensation.

Various examples.

20A-391. Temperature of Cutting and Method of Its Determination. (In Russian.) A. P. Gulyaev. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, June 1949, p. 717-723.

Method for approximate determination of cutting temperature at the contact point of the cutting tool and in adjacent regions. Application of the method resulted in development of certain qualitative relationships.

20A-392. Electronic Contour Machining System. *Iron Age,* v. 164, Sept. 15, 1949, p. 90.

Electronic instrument developed by General Electric.

20A-393. Unusual Operations on Cylindrical and Centerless Grinders. H. E. Balsiger. *Machinery* (American), v. 56, Sept. 1949, p. 151-158.

How standard grinding machines can be modified into specialized production machines capable of finishing many different materials in a wide variety of shapes. Unusual set-ups on centerless, plain, universal, and cam-grinding machines.

20A-394. Determining Radial Clearance on Thread Milling Cutters Without Lead. Sherwood C. Bliss. *Machinery* (American), v. 56, Sept. 1949, p. 158-160.

Geometrical method.

20A-395. How to Estimate Milling Costs in the Job Shop. Herbert W. Brown. *Machinery* (American), v. 56, Sept. 1949, p. 162-168.

Procedure for applying an estimating plan to horizontal milling jobs. Third of series.

20A-396. Broaching "Christmas Tree" Slots in Jet-Engine Turbine Wheels. *Machinery* (American), v. 56, Sept. 1949, p. 177.

20A-397. Quick-Acting Slot-Drilling Jig. H. Moore. *Machinery* (American), v. 56, Sept. 1949, p. 197.

Jig can be adapted for different sizes of shafts and slots merely by equipping it with various sizes of drill guides.

20A-398. Fixture for Grinding Conical Shaft Ends Concentric With the Shaft. Clifford T. Bower. *Machinery* (American), v. 56, Sept. 1949, p. 197-198.

20A-399. Eight Spindle Double Index Chucking Machine Makes Part Complete by Machining Both Ends Simultaneously. *Screw Machine Engineering,* v. 10, Sept. 1949, p. 27-30.

20A-400. Carbide Tooling on Multiple Spindle Automatics. *Screw Machine Engineering,* v. 10, Sept. 1949, p. 32-35.

Two jobs illustrate trends in carbide application to above.

20A-401. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Sept. 1949, p. 41-46.

Relation to other operations, maintenance of close tolerances, and special vs. standard tooling. Various holding devices.

20A-402. Pitfalls to Avoid in Tooling Automatic Screw Machines. Part Twelve. Noel Brindle. *Screw Machine Engineering,* v. 10, Sept. 1949, p. 48-51.

Broader use for Brown & Sharpe automatic screw machines by utilizing extra capacity turning and feeding movements and larger stock facilities.

20A-403. Automatic Mechanically-Operated Milling Fixture. R. Mawson. *Machinery* (London), v. 75, Sept. 1, 1949, p. 318-319.

20A-404. Sur l'avantage du travail en compression des outils de coupe. (Concerning the Advantages of Operating Cutting Tools Under Compression Forces.) Félix Eugène and René Dufaud. *Comptes Rendus* (France), v. 229, July 4, 1949, p. 53-54.

A comparative study of two modes of attachment of cutting tools: one with tool axis parallel and the other perpendicular to the applied force. Relation of rate of cutting to tool life and microstructure of surfaces obtained. The arrangement in which the tool works under compression resulted in increased tool life with no appreciable difference in quality of surfaces obtained.

20A-405. Home-Ground Step Drills Replace Subland Type. *Iron Age,* v. 164, Sept. 22, 1949, p. 88.

Substantial savings in tool cost are being made by Oldsmobile by substituting two-flute step drills with special grinding done in their own toolroom for four-flute subland drills.

20A-406. Shop Shots From Sangamo. *American Machinist,* v. 93, Sept. 22, 1949, p. 96-97.

Several machine-shop operations at Sangamo Electric Co.

20A-407. Special Tooling Makes Precision Racks and Pinions. H. J. Williams. *American Machinist,* v. 93, Sept. 22, 1949, p. 98-99.

20A-408. Math Cuts Cost of Machining Studies. M. Kronenberg. *American Machinist,* v. 93, Sept. 22, 1949, p. 104-106.

Dimensional analysis often permits substantial reductions in the cost of metal-cutting investigations. Through this technique, reliable information can be obtained from incomplete sets of experiments, thereby saving an appreciable part of the expense of collecting complete experimental data.

20A-409. Practical Ideas. *American Machinist,* v. 93, Sept. 22, 1949, p. 125-130.

Consists of the following: light, decorative work turned in ellipse-generating chuck (Michael P. Blake); adjustable angle plate guides dresser-holds setup (Al Lemprecht); parallel bar checks irregularities in long, flat surface (David T. Lyons, Sr.); slide-ways for drill vises abolish clamping time (Allan Clark); ball bearing and bearing ball support tailstock pipe center (Tyler G. Hicks); lathe tool-holder prevents toolbit breakage (J. Martin); layout and scoring method matches cams with pistons (W. A. Hahn); collet closer handles rough dividing-head mill work (Lew Suverkrop); threaded adapter holds screws for special machining (George F. Burnley); cast iron as a die material (J. H. Sperman); touch-and-gap technique gages unusual parts (Robert Mery); how to cut metric threads (J. Martin); single-point threading tool taps large or odd profiles (John Settle); automatic drill release clears drillpress spindle (F. E. Riley); and other miscellaneous shop hints.

20A-410. Chart for Estimating Cutting Time. *American Machinist,* v. 93, Sept. 22, 1949, p. 143.

Permits quick estimates of time required for turning and boring work.

20A-411. Selection and Working of Metals Prior to Finishing Operations. Edward Engel. *Tool Engineer,* v. 23, Sept. 1949, p. 28-30, 34.

Recommendations applicable to all phases of machine-shop procedures including selection of metals, cutting tools, and fluids, relative merits of grinding and machining, etc.

20A-412. Permanent Tooling for Short Setup Multiple Drilling. J. I. Karash. *Tool Engineer,* v. 23, Sept. 1949, p. 31-32.

Typical examples. Factors to be considered before adoption.

20A-413. Crush Dressing of Grinding Wheels. D. H. Currie. *Tool Engineer,* v. 23, Sept. 1949, p. 33-34.

20A-414. The Milling Process. Mario Martelloti. *Tool Engineer,* v. 23, Sept. 1949, p. 35-39.

Details of calculations.

20A-415. Gadgets. *Tool Engineer,* v. 23, Sept. 1949, p. 55-56.

"Drill Fixture for Odd-Contour Handle", Ingvar Okerfors; "Attachment for Drilling Angular Holes", H. Moore; "Mandrel for Threaded Parts", Geo. W. Brown; and other miscellaneous shop hints.

20A-416. Rotary Gang Slitting. Eugene L. Mackey. *Steel,* v. 125, Sept. 26, 1949, p. 66-70, 88, 90; Oct. 3, 1949, p. 75-78, 80.

Relative advantages of drive and pull-type slitting lines and factors in selection and operation, ratio of slitting time to total cycle time, advantages and disadvantages of large coils, high speed, and coil cars. Time studies were made on a wide range of coil sizes. Techniques used to slit flat sheets, scrap disposal methods, and equipment required to slit narrow strands. (To be concluded.)

20A-417. Electronic Control. S. A. Ghalib. *Aircraft Production,* v. 11, Sept. 1949, p. 303-305.

Machine-tool applications for control of speed, feed, and profile machining.

20A-418. Templates for Rapidesign. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 104-106.

Design and fabrication of precision templates used in drafting rooms.

20A-419. Shop Problems. H. Sanders. *Machinery Lloyd* (Overseas Edition), v. 21, Aug. 27, 1949, p. 83-85.

Series of problems and their solutions: boring tapered holes; grinding cutting tools; making form tools; choice of wheels; dressing the wheel; finning tools; reaming problems; and the square-hole drill.

20A-420. Design Trends and the Style of Machine Tools. Lathes. Part II. Tibor Haas. *Engineers' Digest,* v. 10, Aug. 1949, p. 284-288, 299.

20A-421. Strain Gage Dynamometer for Measuring Cutting Tool Loads. H. Rottersman, A. J. Bettinger, and W. P. Blake. *Iron Age,* v. 164, Sept. 29, 1949, p. 55-61.

During research into hot machining potentialities, the need arose for a cutting-tool load-measuring device. The instrument developed is simple to operate, accurate, able to measure instantaneous loads, inexpensive to construct, and caused no interference with machining operations. Construction, calibration, and use.

20A-422. Machining Sintered Powdered-Metal Bearing Materials. E. J. Weller. *Machinery* (London), v. 75, Sept. 8, 1949, p. 341-343.

Recommended procedures and tool designs.

20A-423. Form Turning and Boring With a Dial Indicator Attachment. A. Maier. *Machinery* (London), v. 75, Sept. 8, 1949, p. 343-344.

Setup for machining the cavity of a die-casting die for wheel hubs, a typical example of the above.

20A-424. Crossed Axis Shaving of Gears. H. Pearson. *Machinery* (London), v. 75, Sept. 8, 1949, p. 350-352.

20A-425. Talented Tooling. *American Machinist,* v. 93, Oct. 6, 1949, p. 122-123.

Includes short items entitled: Toolmaker's buttons control drill jigs; Impellers produced by double-grinding; Automatic recessing tool grooves forged links; Motorcycle cylinders honed at high speed; and Flute-to-center check measures taps.

20A-426. Universal Dies for Short-Run Jobs. Federico Strasser. *American Machinist,* v. 93, Oct. 6, 1949, p. 127.

Advantages and limitations.

20A-427. Practical Ideas. *American Machinist,* v. 93, Oct. 6, 1949, p. 132-136.

Includes short items entitled: Large power tapping machine made from cast-off parts (Dan Penway); Revised drilling method eliminates slow layout work (Clement F. Brown); Spot weld tacking simplifies assembly fixtures (H. Shum); Scissor extractor lifts ball bearings (R. B. Wolverhampton); Swinging needle indicates lathe-center tightness (H. Moore); Shop slotter constructed from welded frame and shaper (Lowell F. Stull); Lathe takes over mill job to balance machine load (Lyle C. Vinger); Indicator gage checks grooves (H. G. Frommer); and other miscellaneous shop hints.

20A-428. An Analysis of Blanking Die Designs, Part VII. C. W. Hinman.

Modern Machine Shop, v. 22, Oct. 1949, p. 152-154, 156, 158, 160.
Special blanking and cutting dies, universal notching dies, the cutting of double rows of alternate blanks, and multiple perforating and blanking.

20A-429. Rear-Facing Attachment for Lathes. Albert Maier. *Machinery* (London), v. 75, Sept. 29, 1949, p. 447-448.

20A-430. Economies in Grinding Obtained by Automatic Sizing Devices. J. C. Zelenka. *Machinery* (London), v. 75, Sept. 29, 1949, p. 449-450.

20A-431. What Economies Can You Expect From the Use of Solid Carbide Insert Cutting Tools? William F. Scheicher. *Machine and Tool Blue Book,* v. 45, Oct. 1949, p. 85-88, 90, 92-96.
Case histories, photos, and drawings.

20A-432. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 10, Oct. 1949, p. 26-30.
Use of machining-rate tables, factors determining ultimate h.p. demand on machine motors, correlation of 1st and 2nd chuckings, planning bar-stock jobs, and toggle-bolt second-operation tooling.

20A-433. Economical Production of Short Run Jobs. William Orebaugh. *Screw Machine Engineering,* v. 10, Oct. 1949, p. 45-50.
Complete detail set-ups for economical screw-machine production of motor pulleys, adjusting nuts, and socket holders.

20A-434. Magazine Automatic Pneumatic Bar Feed. *Screw Machine Engineering,* v. 10, Oct. 1949, p. 53-56.
Unit cuts down unproductive time.

20A-435. Milling Fixture Design and Use. Mario Martellotti. *Tool Engineer,* v. 23, Oct. 1949, p. 34-37.

20A-436. Reversible Low Production Tool for Irregular Casting. C. F. Brown. *Tool Engineer,* v. 23, Oct. 1949, p. 40.

20A-437. Turbine-Blade Production. *Aircraft Production,* v. 11, Oct. 1949, p. 323-330.
Methods and equipment. Several ingenious adaptations of standard types of machine-tools. Also the tooling can be applied, with minor variations, to a considerable range of blade sizes and forms.

20A-438. Skin Milling. *Aircraft Production,* v. 11, Oct. 1949, p. 340-341.
Planer-type machines for large-area sheets.

20A-439. Profile Cutting. *Aircraft Production,* v. 11, Oct. 1949, p. 342.
Equipment using electronic control from a paper templet.

20A-440. Tool Engineering Ideas. *Machinery,* v. 56, Oct. 1949, p. 193-197.
"Quick-Acting Attachment for Lathe Tailstock", Robert Mawson; "Swivel Mounting With Indicator for Accurate Positioning", F. Server; "Clip-Forming Die", L. Kasper; "Method of Laying Out Conical Shapes to Specific Dimensions", George Pheil; and "Determining the Approximate Brinell Hardness of Large Parts", Fred B. Money.

20A-441. Improved Method of Size Control for External Grinding. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 46.

20A-442. Simple Fixtures Speed Disk Grinding. R. L. Clark. *American Machinist,* v. 93, Oct. 20, 1949, p. 74-75.

20A-443. Back-Sliding Cutter Mills Tight Corners. Joseph K. Row. *American Machinist,* v. 93, Oct. 20, 1949, p. 78-79.
Special attachments which make possible radical departures from standard milling practice in close quarters.

20A-444. How Do Multiple-Thread Hobs Behave? Part 2. J. P. Breuer. *American Machinist,* v. 93, Oct. 20, 1949, p. 84-86.
Effect of all combinations of major hob elements on gear-tooth form, spacing, and finish.

20A-445. Modern Gear Cutting Equipment. Charles G. Pfeffer. *American Machinist,* v. 93, Oct. 20, 1949, p. 87-98.
Special section deals in detail with principles, types, and capacities.

20A-446. Long Helical Cams Cut on a Gear Shaper. Wm. M. Stocker, Jr. *American Machinist,* v. 93, Oct. 20, 1949, p. 100-101.

20A-447. Practical Ideas. *American Machinist,* v. 93, Oct. 20, 1949, p. 106-110.
Includes the following: spanking punch forces double action in strap-forming die (B. A. Lee); level squares up shaft for interrupted keyway cuts (R. W. Young); bandsaw table attachment allows accurate circular cutting work (Allan B. Nixon); radial drill and portable grinder combined to grind tank vanes (Allan Clarke); circular dovetails cut into valves for brass shock rings; jig plate and box layout approach jig-boring accuracy (Gerrit Vander Lee); eccentric sleeve adjusts boring-bar height (Daniel Love); four work-holders simplify hand operations on small parts (Tyler G. Hicks); and other miscellaneous shop hints.

20A-448. When To Use Standard Carbide Insert Tools and Holders. *Screw Machine Engineering,* v. 10, Oct. 1949, p. 58-59.

Six standard Carboloy insert holders are said to cover a major portion of ordinary production and semi-production work. Standards, together with information on where and when to use each type, described and diagrammed.

20A-449. (Book) **Metal-Cutting Tool Handbook.** 647 pages. 1949. Metal Cutting Tool Institute, 405 Lexington Ave., New York 17, N. Y. $6.50.

Information on various types of metal-cutting tools, their operation and maintenance.

20A-450. Rotary Drill Jig Reduces Machine Downtime. *Iron Age*, v. 164, Oct. 20, 1949, p. 74.

Jig for production of cast low-pressure discharge manifolds. Problems of moving the jig and rotating it for drilling are overcome by use of a rotary jig of novel design.

20A-451. Designing Carbide Insert Tools and Holders for Special Purposes. *Modern Industrial Press*, v. 11, Oct. 1949, p. 54, 56.

20A-452. Planning Production of Machined Parts. T. O. Davies. *Western Machinery and Steel World*, v. 40, Oct. 1949, p. 62-65.

Procedures for planning of tooling for machined aircraft parts.

20A-453. Tapered Skins Save Weight. A. C. Slatter and J. J. Sloan. *Western Machinery and Steel World*, v. 40, Oct. 1949, p. 78-81.

Production of tapered metal sheets for aircraft use by machining.

20A-454. Checks Insure Accuracy. *Western Machinery and Steel World*, v. 40, Oct. 1949, p. 93.

Regular testing procedure applied to hobbing machines at Westinghouse's Sunnyvale plant to insure accurate alignment.

20A-455. What Is the Best Buy in Cutting Fluids? O. S. Miller. *Western Machinery and Steel World*, v. 40, Oct. 1949, p. 94-95.

Factors to be considered in selection.

20A-456. Unusual Screw Machine Operations. Herbert Chase. *Steel*, v. 125, Oct. 31, 1949, p. 51-52.

Buick setups which adapt automatics to machining of long shift levers, helical grooves on speedometer shaft with single-point tool, and to cross-drilling of small stepped control valves.

20A-457. Unusual Operations on Shaping Machines. J. J. Murphy. *Machinery* (London), v. 75, Oct. 6, 1949, p. 485-487.

Several setups for high-production operations in which a number of cuts are made simultaneously.

20A-458. Nomogram for Turning and Boring Times. O. F. Mayer. *Machinery* (London), v. 75, Oct. 6, 1949, p. 490.

Includes illustrative example.

20A-459. Die Bedeutung des Feinziehschleifens; Entwicklung und Stand des Verfahrens. (Significance of the Superfinishing Process; Its Development and Status.) Herwart Opitz and Karl Krümmel. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, Sept. 1, 1949, p. 417-424.

Wear resistance of bearing surfaces depends largely on surface conditions. Experimental results and methods of applying superfinishes. Equipment and resulting surfaces. 20 ref.

20A-460. Errors of Single-Start Hobs for Involute Gears as Used in Precision Instruments and Their Influence on the Generated Tooth Shape. (Continued.) Herbert Göttsching. *Microtecnic* (English Edition), v. 3, July-Aug. 1949, p. 146-152. Translated from the German.

Detailed analysis, illustrated by diagrams.

20A-461. Down Cut Gear Milling Machines. A. Léauté and F. Jombart. *Microtecnic* (English Edition), v. 3, July-Aug. 1949, p. 182-186. Translated from the French.

20A-462. Heating During Cutting of Metal. (In Russian.) G. A. Oding. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 585-587.

Relationship between machinability and heating of a carbon steel. Method of study.

20A-463. Energy Balance in the Metal Cutting Process. (In Russian.) G. I. Epifanov and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 1, 1949, p. 653-656.

Attempts to determine the part of the energy absorbed by the plastic deformation of turnings and to establish the influence of surface-active media on the value of absorbed energy. Method of investigation and test apparatus.

20A-464. Method of Theoretical Analysis and Calculation of Characteristics of Drill Presses. (In Russian.) A. I. Kashirin and F. A. Barbashov. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Apr. 1949, p. 1-7.

Method of determining productive capacities of individual tools and their operating conditions. Diagrams plotted according to this method permit determination of basic parameters of operation and most advantageous order of operation.

20A-465. Simultaneous Grinding and Checking Method. *Steel*, v. 125, Nov. 7, 1949, p. 118-119.

Procedure devised by Cincinnati Milling Machine Co. which gives complete control of vertical and transverse movements necessary to grind an accurate profile, and also supplies an optically enlarged view of the shape of the workpiece plus a master drawing made to the same ratio.

20A-466. Standard Clamping and Holding Devices. *Tool & Die Journal*, v. 15, Nov. 1949, p. 53-56, 58.

Variety of devices used in machining operations.

20A-467. New Davenport Attachment Speeds Milling Operations. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 27-30.

Screw-machine setups for milling hexagons or washer-faced nuts. By adding a mechanism known as a "Revinloc" to a rotary slotting attachment equipped with two milling cutters, it is possible to mill the three sets of flats which produce the hexagon in 0.6 sec.

20A-468. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 32-35.

Recommended practice is summarized and clarified by examples.

20A-469. Converted Bar Automatic Machines 4,000 Parts Per Hour. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 41-43.

The part referred to is a cast iron valve-guide bushing which requires a groove cut in the large outside diameter. Each spindle and cross slide combine to machine a separate part simultaneously.

20A-470. Cleveland Model AB Dialmatic. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 50-53.

Details of single spindle, five-hole turret automatic.

20A-471. Maintenance of Carbide Insert Holders and Tools. *Screw Machine Engineering*, v. 11, Nov. 1949, p. 59.

Recommendations.

20A-472. Machining Operations on Hoover Cleaners. Fred W. Vogel. *Modern Machine Shop*, v. 22, Nov. 1949, p. 116-118, 120, 122.

20A-473. Ideas From Readers. *Modern Machine Shop*, v. 22, Nov. 1949, p. 206, 208, 210, 212, 214, 216, 218.

"Using a Lathe as a Milling Machine", Robert Mawson; "An Adjustable Tool for Finishing Ball Seats", Roger Isetts; "A Method for Spacing Slitter Rolls", Wallace C. Mills; and "A Simple Method for Aligning Milling Machine Cutters", Michael Axler.

20A-474. Low Cost Tooling. Estimating and Economics. 1. Predesign Estimating. G. M Foster. **2. Postdesign Estimating.** George S. Clarke. *Tool Engineer*, v. 23, Nov. 1949, p. 25-29.

Concerned with machine-shop and press operations.

20A-475. Design of Fixture Elements: Clamps. Hans W. Smith. *Tool Engineer*, v. 23, Nov. 1949, p. 34-36.

Examples of typical recommended designs.

20A-476. Gadgets. *Tool Engineer*, v. 13, Nov. 1949, p. 46-47.

"Spot Facer for Narrow Places", H. Moore; "Micrometers on Lathe Hand Wheels", Hugh Maroney; "Milling on the Punch Press", Robert Mawson; "Rubber Pad for Sweep Cutter", C. G. Spicer; "Collet for Gripping Bar Automatically", F. E. Riley; and "Automatic Container Closer", J. H. Quakimeyer.

20A-477. Recent Developments in Contour Friction Sawing. *Machine and Tool Blue Book*, v. 45, Nov. 1949, p. 119, 124.

20A-478. Cutting Fluids. H. W. Smith. *Production Engineering & Management*, v. 24, Nov. 1949, p. 43-46.

Types and applications; their effect on various machining factors. Heavy-duty soluble oils have been developed which, through special additives, can replace mineral oils.

20A-479. High Output Obtained With Production Drilling Units. *Production Engineering & Management*, v. 24, Nov. 1949, p. 47.

Machine which performs hollow milling, spot facing, drilling, and tapping operations economically. Machine is equipped with individual power units.

20A-480. Cutting Sprockets for Silent Chain Drives With One Pair of Cutters. J. L. Jessup. *Machinery* (London), v. 75, Oct. 13, 1949, p. 524-526.

Calculations required for setting up the operation and for designing the required cutters.

20A-481. The Manufacture of Turbine Blades. Methods Employed by the Brush Electrical Engineering Co., Ltd. *Machinery* (London), v. 75, Oct. 20, 1949, p. 547-554.

20A-482. Herbert-Swift Lathe With Optical Control. *Machinery* (London), v. 75, Oct. 20, 1949, p. 568-573.

New development for accurate positioning of cutting tools in obscured positions.

20A-483. Second-Operation Costs Reduced by Special Equipment. Thomas J. Johnson. *American Machinist*, v. 93, Nov. 17, 1949, p. 85-89.

Setups for a variety of small-part jobs involving drilling, deburring,

and tit removal which cannot be done with screw-machine attachments.

20A-484. Two Methods Lap Small Curved Surfaces. Chester S. Ricker. *American Machinist*, v. 93, Nov. 17 1949, p. 96-97.

How diesel-injector valves and hydraulic-valve tappets for automobiles are both curve-lapped. Size differences make it necessary to use two different methods.

20A-485. Stopping Fires in Screw Machines. Walter E. Morgan *American Machinist*, v. 93, Nov. 17, 1949, p. 118-119

Automatic extinguishing system built into screw machines using light cutting oil extinguishes flash fires without serious damage.

20A-486. Practical Ideas. *American Machinist*, v. 93, Nov. 17, 1949, p. 120-124.

Scaling tool and V-groove core increase cast-pulley output (Frederick G. Hawk); spring-loaded boring tool relieves itself for roughing (Daniel Love); laminated bushing braces drill for piercing stainless steel (Basil Clark); dial-indicator stand permits close final adjustment (R. B. Wolverhampton); precision drilling jig speeds spot-drilling on accurate layouts (N. Bonamini); electronic circuit indicates bar-stock temperature (Chapman Valve Mfg. Co.); grinder safety shield switches on motor (F. E. Riley); life of carbide inserts increased by brazing (Stanley R. Welling); gaging disks check holes in machined housings; and other miscellaneous shop hints.

20A-487. How To Estimate Drilling and Boring Costs on Boring Mills. Herbert W. Brown. *Machinery* (American), v. 56, Nov. 1949, p. 200-204.

Fourth in a series of articles on estimating machining costs in the job shop.

20A-488. Tool Engineering Ideas. *Machinery* (American), v. 56, Nov. 1949, p. 205-208.

Indexing fixture with quickly removable bushing bar, Harold E. Murphey; Special arbor and key for holding gear blank while machining, Stanley R. Welling; Simple diaphragm pump for removal of liquids, Edwin F. Mosthaf; Centralizing tool that simplifies milling cutter setup, J. Homewood; Chip shield for milling fixture clamps, Cliff Bossmann.

20A-489. Certain Problems of the Dynamics of Transverse Planing Machines. (In Russian.) Yu. I. Anosov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 10-13.

Theoretical analysis of a series of problems using electrical analogies and models.

20A-490. Polishing of Hard-Alloy Blades. (In Russian.) R. M. Kolker. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 17-19.

Method of polishing cutting tips made of hard, nonmagnetic alloys and joined by copper solder. Operation of recommended machine and step-by-step procedure.

20A-491. Analysis of Methods for Evaluating Sharpness of Cutting-Tool Edges. (In Russian.) A. I. Grechukhin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 21-22.

Several methods commonly used in the U.S.S.R. Specific applicability of each.

20A-492. Technical Basis for Standardization of the Electrical-Energy Consumption of Metal-Working Plants. (In Russian.) A. L. Matveer. *Promyshlennaya Energetika* (Industrial Power), v. 6, June 1949, p. 5-7.

Standard energy consumption data for different machine-shop and press operations on different metals and alloys.

20A-493. Novel Vise Jaws Increase Production. Robert Mawson. *Iron Age*, v. 164, Nov. 24, 1949, p. 80-81.

Slotted jaw designed for work on filister-head screws. It holds 30 screws at a time for slot machining.

20A-494. Design Considerations of Special Carbide Insert Holders. *Steel*, v. 125, Nov. 28, 1949, p. 76.

20A-495. Uniformity in Finished Work Promoted by Special Machine Designed to Perform Four Operations on Bicycle Pedal Crank. *Steel*, v. 125, Nov. 28, 1949, p. 72.

20A-496. Jig Borer for Navy Job Shop. James R. Langham. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 82-84.

Equipment at U. S. Navy Electronics Laboratory, Point Loma, Calif.

20A-497. More Western-Built Tools. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 86-89.

Machine-shop equipment and procedures in manufacture of woodworking tools.

20A-498. Automatic Sizing Applied to Plain Grinders. Wm. M. Stocker, Jr. *American Machinist*, v. 93, Dec. 1, 1949, p. 93-100.

Machine and gage manufacturers provide a variety of automatic size-control gages for cylindrical grinders. These increase production and

lower costs, meanwhile holding closer limits than usual with manual control. Available types and their application to various grinding machines.

20A-499. Practical Ideas. *American Machinist,* v. 93, Dec. 1, 1949, p. 111-116.

Includes the following: strip-stock roll mount adjusts for pressure and register (F. H. Hartley); extra traversing accuracy provided by dividing head (Thomas C. Ash); rugged micrometer measures three-flute cutting tools (Leslie Morrissette); enlarging with counterbore eases large-hole drilling (Frank J. Peragine); two plugs check centers on intersecting holes (D. E. Sweet); vise bars clamp large number of round parts (R. Mery); notched stock cut in press with multiple-die formation (C. Jaikens); index-head setup produces turned spiral in plate (Bernard Levowich); rotating fixture on angle plate indexes parts for drilling (H. G. Frommer); chuck adapted to live center holds centerless parts (Allan B. Nixon); and other miscellaneous shop hints.

20A-500. Simple Indexing. Wm. H. Siebrecht. *American Machinist,* v. 93, Dec. 1, 1949, p. 127, 129, 131.

Table avoids need for extended calculations to find number of turns and crank travel required for any problem in simple or plain indexing.

20A-501. Turbine-Blade Production: Platform-Squaring and Root-Forming Operations; Honing and Polishing. *Aircraft Production,* v. 11, Nov. 1949, p. 362-369.

Second and concluding installment.

20A-502. Optically-Controlled Turning. *Aircraft Production,* v. 11, Nov. 1949, p. 376-381.

British lathe for machining of gas-turbine axial-flow-compressor casings.

20A-503. An Analysis of the Mechanics of Metal Cutting. D. C. Drucker. *Journal of Applied Physics,* v. 20, Nov. 1949, p. 1013-1021.

Attempts to go beyond an idealized description of the process of metal removal. The details of two-dimensional orthogonal cutting are investigated, and several concepts and hypotheses are introduced which apply equally well to the most general cutting operation. 12 ref.

20A-504. Precision "Borizing" Operations. *Machinery* (London), v. 75, Nov. 3, 1949, p. 647-648.

The term "borizing", as applied to Heald Borematics, covers boring, turning, facing, chamfering, and grooving operations, using single-point cemented carbide tools at high speeds and fine feeds. Typical examples.

20A-505. The Economics of Machining Operations. J. M. Lickley and A. J. Chisholm. *Machinery* (London), v. 75, Nov. 10, 1949, p. 673-678.

Fundamentals of economical operation, tool-life data, manufacturing costs, analysis of machining costs, and practical limitations.

20A-506. Engineering Metal Pattern Equipment. H. A. Burton. *American Foundryman,* v. 16, Nov. 1949, p. 48-50.

Machine-shop methods for patterns. Merits of various metals.

20A-507. Efficient Tooling Innovations for Liquid Control Products. *Production Engineering & Management,* v. 24, Dec. 1949, p. 53-60.

Equipment and machine-shop procedures for production of gasoline pumps, vacuum stills and other liquid handling equipment.

20A-508. A Cost-Cutting Method for Generating Cam Forms. J. Harrington. *Production Engineering & Management,* v. 24, Dec. 1949, p. 61-64.

How contour sawing can be utilized to good advantage for processing cams for automatic machine-tool operations.

20A-509. Internal Work Clamping. Frank J. Peragine. *Production Engineering & Management,* v. 24, Dec. 1949, p. 70.

Fixture to be used where workpiece is to be machined on the outside diameter and the face, and the hole is to be bored and the bore chamfered. By clamping on the interior of the workpiece, all of the operations can be performed with one setup.

20A-510. Controlled Air Power Cuts Manufacturing Costs. J. G. McComb. *American Machinist,* v. 93, Dec. 15, 1949, p. 88-89.

Application to several machining production jobs.

20A-511. Optical Tools for Shop Precision. Charles Emerson. *American Machinist,* v. 93, Dec. 15, 1949, p. 91-98.

Fundamental principles and practical application of optical tools for measurement and inspection.

20A-512. Hand Lapping Still Pays Off. B. M. Peterson. *American Machinist,* v. 93, Dec. 15, 1949, p. 99-101.

Production of job-lot valve-bonnet and disk surfaces which require precise optical flatness—done with abrasive stones that themselves must be lapped to precise flatness.

20A-513. Pneumatic Tube Feeds Automatic Work Loader. J. W. Hillhouse.

American Machinist, v. 93, Dec. 15, 1949, p. 101.

Use on a trimming lathe for small-part production.

20A-514. Water-Soluble Oil Proves Good Screw-Machine Lubricant. Ralph Hause. *American Machinist,* v. 93, Dec. 15, 1949, p. 105.

Favorable experiences.

20A-515. Practical Ideas. *American Machinist,* v. 93, Dec. 15, 1949, p. 109-114.

Includes the following: bench threading and tapping machine alters and finishes standard screws (R. B. Wolverhampton); automatic stamping machine marks soft metals (D. E. Sweet); disk gages check top rake on circular form tools (Otto V. Howe); electromagnetic table holds plates on boring mill (F. G. Forquer); second adapter speeds standard punch setup (Alfred Rheingold); combined turret tool does both straight boring and recessing (B. A. Lee); two pneumatic systems control shear blade and hold-downs (Ed Holbrook); combined boring-bar tools rough and finish in one pass (Charles A. Lauer); vertical ram press profiles simple flat workpieces (Dan J. Penway); tapered mandrel quickchecks washers and similar parts (Frederich Jerome); bearing housing finished by setting tool to surface gage (H. Moore); lathe cutter machines keyways (Lowell F. Stull); and other miscellaneous shop hints.

20A-516. Fixture for Grinding Concentric Conical Ends on Shafts. C. T. Bower. *Machinery* (London), v. 75, Nov. 17, 1949, p. 715.

20A-517. Boring "D" Shaped Holes. G. R. Ball. *Machinery* (London), v. 75, Nov. 24, 1949, p. 743.

Special apparatus and technique.

20A-518. Some Unusual Operations on Ryder Verticalautos. G. C. Batemen. *Machinery* (London), v. 75, Nov. 24, 1949, p. 744-749.

"Verticalautos" are a series of drill-press type machines made by a British firm. Operations performed include multiple-drilling, counter-boring, and tapping; cross-drilling, and the turning of work between centers. Examples of tool layouts incorporating the new attachments.

20A-519. Taylor and High-Speed Cutting of Metals. *Current Digest of the Soviet Press,* v. 1, Nov. 29, 1949, p. 3-12.

Condensed translations from several current Soviet periodicals. The work of Frederick Taylor and of other Americans on the theory and practice of metal cutting is severely criticized, on the basis of both correctness and originality. Russians are said to have made prior discoveries in theory and practice. No technical information is included.

20A-520. Determination of Machinability of Metals. (In Russian.) E. I. Fel'dshtein. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 17-18.

Rapid method based on measurement of temperatures close to the cutting zone in both the cutting tool and the metal being cut. Thermocouple arrangement and typical results.

20A-521. Electromechanical Dial for Lathe Turning of Multistage Shafts. (In Russian.) A. I. Bolotin and P. D. Petrenko. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 19-20.

Device which relieves operator from measuring the shaft during work and automatically indicates longitudinal travel with accuracy up to 0.1 mm.

20A-522. Shaping of Teeth of Hardened Gears. (In Russian.) V. I. Korzinkin. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 21-23.

New, more rapid methods using a standard type of milling machine.

20A-523. Methods and Apparatus for Control of High-Precision Small-Diameter Boring. (In Russian.) I. A. Grigor'ev. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 1-7.

Precision and suitability of a series of mechanical, optical-mechanical, electrical and pneumatic devices. Structural details of these devices, and advantages, disadvantages and fields of application of each.

20A-524. Measurement of Angle of Taper of Cutting Edges of Arbitrary Shape. (In Russian.) S. A. Vinokurskii. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 11-14.

New method based on use of a double microscope.

20A-525. Circular Tangential Cutting Tools. (In Russian.) S. A. Rubinshtein. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 14-17.

Theoretical bases for design. Methods of determining optimum dimensions. Formulas are graphically interpreted. Sample calculations are performed.

20A-526. Some Unusual Grinding Operations. *Machinery* (London), v. 75, Dec. 1, 1949, p. 783-788.

Parts having interrupted cylindrical surfaces, multiple diameters, tapers, and many other forms can be economically finished on standard cylindrical grinding machines which have been suitably modified.

20A-527. Superfinishing. Part I. Application and Advantages; Producing High-Quality Finish Rapidly and Economically. Part II. Operating Conditions; Flat-Surface Superfinishing. E. J. Napier. *Aircraft Production,* v. 11, Nov. 1949, p. 385-388; Dec. 1949, p. 421-423.

Developments which have taken place in a British company and some of the advantages gained by use of superfinishing.

20A-528. Floating-Rotor Motor Utilized for Spindle Advance in Package Unit. *Machine Design,* v. 21, Dec. 1949, p. 135-136.

Semi-automatic indexing machine for drilling and tapping bicycle pedal cranks.

20A-529. Convertibility of Automatics Facilitates Small-Lot Production. *Machinery* (American), v. 56, Dec. 1949, p. 146-149.

Typical production setups using a new single-spindle automatic made by Cleveland Automatic Machine Co., which can easily and quickly be converted from a bar to a chucking machine.

20A-530. Rotary Tables Increase Flexibility of Horizontal Boring, Drilling, and Milling Machines. *Machinery* (American), v. 56, Dec. 1949, p. 180-182.

20A-531. Tool Engineering Ideas. *Machinery* (American), v. 56, Dec. 1949, p. 191-194.

"Milling Fixture for Right and Left-Hand Forgings", R. Mery; "A Milling Machine Turntable That Reduces Friction in Indexing", Robert Mawson; "Simple Measuring Tool for Quickly Determining Developed Lengths", Rogert Isetts; and "Faceplate Fixture for Boring an Unsymmetrical Casting", F. H. Scriber.

20A-532. Limited Production. 1. Economics of Limited Production. E. P. Blanchard. **2. Tools, Materials, and Methods for Limited Production.** J. B. Savits. **3. Quality Control of Limited Production.** C. D. Wright. *Tool Engineer,* v. 23, Dec. 1949, p. 20-25.

General principles applicable to small or medium manufacturing shops.

20A-533. Economic Factors in Milling. Mario Martellotti. *Tool Engineer,* v. 23, Dec. 1949, p. 29-33.

Recommended procedures for handling, storage, and grinding of milling cutters. Includes diagrams and charts. Selection of cutting speeds and work-holding methods.

20A-534. Gadgets. *Tool Engineer,* v. 23, Dec. 1949, p. 44-45.

"Offset Drill Head Extends Range of Drill Press", H. G. Frommer; "Automatic Machine Stop", A. H. Colombe; "Adjustable Spring Stripper", Robert D. James; "Collet for Polygonal Stock", E. Rodeck; and "To Shape or Drill Glass" (anon.).

20A-535. Special Tooling and Attachments for Brown & Sharpe Automatics. *Screw Machine Engineering,* v. 11, Dec. 1949, p. 30-34.

Three relatively complex parts and the setups necessary to produce them on the B. & S. automatic screw machine.

20A-536. Eight-Spindle Chucking Automatic Shortens Production Cycle. *Screw Machine Engineering,* v. 11, Dec. 1949, p. 36-40.

Setups for producing complex part.

20A-537. Tooling Screw Machines With Carbides. J. S. Gillespie. *Screw Machine Engineering,* v. 11, Dec. 1949, p. 44-51.

Some of the fundamentals to be considered in setting up automatic screw machines with carbide tools for cutting steel. Data represents a summary of field reports from screw-machine manufacturers and the findings of comprehensive cooperative studies conducted with a leading user of automatic screw machines.

20A-538. Turret Lathe Practice. E. L. Murray. *Screw Machine Engineering,* v. 11, Dec. 1949, p. 54-59.

Applications of the cross-feeding hexagon turret lathe and standard tools available for use with it.

20A-539. Warner & Swasey Single Spindle Automatic Chucking Machine. *Screw Machine Engineering,* v. 11, Dec. 1949, p. 60-63.

Method of operation.

20A-540. Perform Difficult Operations Easier, Faster With Magnetic Chucks. H. Louis Purdy. *Machine and Tool Blue Book,* v. 45, Dec. 1949, p. 71-78.

An analysis of magnetic chucks and their uses, as well as both common and unusual applications.

20A-541. How Manufacturers Are Using Broaching to Increase Production and Reduce Costs. Herman Reichardt. *Machine and Tool Blue Book,* v. 45, Dec. 1949, p. 98-100, 102-104, 106-107.

A number of varied applications.

20A-542. (Book) **Carbide Cutting Tools; How To Make and Use Them.** Warren Baker and Joseph S. Kozacka. 416 pages. 1949. American Technical Society, Drexel Ave. at 58th St., Chicago. $5.50.

Designed primarily for the vocational student, the machine operator and the tool buyer. Design, manufacture, use, and maintenance of carbide forming or cutting tools, including the conversion of older machines, comparison with high speed tools, and names and characteristics of the different grades of carbide.

20B—Ferrous

20B-1. Specialist in Precision. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 88-89.

Equipment and procedures of Advance Gear Machine Corp.

20B-2. 4400-Pound Casting Machined on Band Saw. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 93.

Two connecting rods were involved and the job consisted of removal of a large section of metal from the ends of the rods. In some places, the metal was 7 in. thick, the cut 22 in. long.

20B-3. Production of Carding Engines. *Machinery* (London), v. 73, Dec. 9, 1948, p. 791-799.

Methods used by a British firm for production of machine for the cotton-spinning industry.

20B-4. Machining of Heat Resistant Steels. (In Russian.) N. N. Zorev. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Sept. 1948, p. 16-18.

Machinability of a steel containing 0.52% C, 13.22% Cr, 13.75% Ni, 3.78% W, 0.64% Mn, 0.4% Si, 0.02% S, and 0.016% P was investigated. Optimum conditions for lathes and milling machines, including tool shapes.

20B-5. Influence of Steel Hardness in Face-Milling. *Machinery* (American), v. 55, Jan. 1949, p. 166. Based on paper by J. B. Armitage and A. O. Schmidt.

Results of face-milling tests on seven different kinds of steels having hardnesses of about Brinell 200, 300 and 400, made to determine power consumption and tool life.

20B-6. Broach Guiding Important in Producing Square Surfaces. *Machinery* (American), v. 55, Jan. 1949, p. 190-191.

Solution of problem in the broaching of large internal involute splines of 8 diametral pitch in forged steel wheel hubs. The problem arose from the fact that the length of broach necessary resulted in deflection of the tool and made it difficult to keep the splines square with the face. Tool deflection was overcome by guiding the broach close to the workpiece.

20B-7. Punch Press Broaches Spline. D. C. Haneline. *American Machinist,* v. 93, Jan. 13, 1949, p. 116.

Above operation in manufacture of steering arms for tractors from SAE 1030-1040 steel.

20B-8. The Baldwin Locomotive Works, Eddystone, Penna. *Production Engineering & Management,* v. 23, Jan. 1949, p. 53-60.

Procedures and equipment. Emphasizes machining operations with brief mention of brazing and soldering.

20B-9. Machining Close Tolerance Parts for Hydraulic Lifts. Frank M. Scotten. *Production Engineering & Management,* v. 23, Jan. 1949, p. 61-62.

20B-10. New Tool Ups Production at Seattle Plant. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 81.

Use of an American duplicating lathe for duplication of shafts.

20B-11. Steam Turbines for Electric Power. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 70-73.

Machining operations and equipment in production of above in Westinghouse's Sunnyvale, Calif., plant.

20B-12. Machining Operations on Steering Assemblies. J. J. Shepp. *Machinery* (London), v. 74, Jan. 13, 1949, p. 35-38.

Methods used by Kaiser-Frazer at Willow Run.

20B-13. "Cool" Grinding Surface Hardened Steel. H. J. Chamberland. *Steel,* v. 124, Jan. 31, 1949, p. 56-58.

Heat generated by the grinding action is substantially reduced and surface cracks thereby eliminated by use of a system which permits coolant to flow through the pores of the grinding wheel.

20B-14. Maschinen und Verfahren in der Rasierklingen-Herstellung. (Machines and Methods Used in the Production of Razor Blades.) F. Kurek. *Zeitschrift des vereines Deutscher Ingenieure,* new ser., v. 90, April 1948, p. 125-128.

Equipment and procedures, including machining and heat treatment.

20B-15. The Machining of Stainless Steel. Part I. Lester F. Spencer. *Steel Processing,* v. 35, Jan. 1949, p. 31-35, 51.

Recommended procedures, based on analysis of the various factors that influence machinability of common stainless steel compositions.

20B-16. Caterpillar's Huge Diesel Engine Plant. Joseph Geschelin. *Automotive Industries,* v. 100, Feb. 1, 1949, p. 30-32, 80, 82.

Machine-shop equipment and procedures.

20B-17. Carbide Tooling Boosts Production 6×'s. *Tool & Die Journal,* v. 14, Feb. 1949, p. 62.

The complete machining of a lightning arrester plug, from SAE 1020 round bar stock.

20B-18. Contour Controls on a Car Wheel Boring Mill. W. B. Wigton. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 86-92, 184, 186.

Fully automatic machining of complex wheel treads at high production rates with single-point carbide-tipped tools has been attained by adaptation of stepping-type relay controls superimposed on magnetic contouring controls for interlocked coordinate movements of several tool heads.

20B-19. Hardness—A Machinability Index? J. B. Armitage and A. O. Schmidt. *American Machinist,* v. 93, Feb. 10, 1949, p. 98-99.

To establish preliminary speed and feed rates, hardness of steel is often taken as an index of machinability. However, tool life and optimum production are affected by composition as well as by hardness. Comparative horsepower and tool-life tests were made on seven representative steels. Output loss per grind is approximately two-thirds when hardness is increased from 200 to 300 Brinell. Sharp reductions in speed and feed are required to mill 400-Brinell steel.

20B-20. Gear Production Speeded Up By Honing Before Hardening and Spline Broaching. William H. Cortwright. *Machinery* (American), v. 55, Feb. 1949, p. 162-164.

Innovation at Warner Gear Div., Borg-Warner Corp.

20B-21. Surface Broaching of Bearing Saddles Aids in Mass Production of Diesel Locomotives. Guy Hubbard. *Steel,* v. 124, Feb. 14, 1949, p. 109-110, 126.

Vertical duplex machine of extraordinary size features an indexing arrangement which divides machining of radius among four cutter segments.

20B-22. Kent-Owens Milling Machine Used for Milling Irregular Slots in Piston Rings. *Modern Machine Shop,* v. 21, Feb. 1949, p. 194, 196.

20B-23. Broaching Cylinder Heads With Single Point Carbide Tipped Tools. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 169-173.

20B-24. Magazine Loading Speeds Gear Shaving. Rex Heath. *Tool Engineer,* v. 22, Feb. 1949, p. 22-23.

20B-25. Making Hydraulic Valve Lifters With Ultra-Precision Equipment. Joseph Geschelin. *Automotive Industries,* v. 100, Feb. 15, 1949, p. 42-45, 82.

Operations at Diesel Equipment Div., General Motors Corp.

20B-26. Progress Report No. 2 on Tool-Chip Interface Temperatures. K. J. Trigger. *Transactions of the American Society of Mechanical Engineers,* v. 71, Feb. 1949, p. 163-170; discussion, p. 170-174.

Effects of cutting speed upon cutting temperature, chip thickness, and chip hardness, when steel at various hardness levels is machined with cemented-carbide tools. In most of the tests a carbide tool containing W, Ti, and Ta was used. A straight WC tool was used in one series of tests.

20B-27. Controlled Power. E. O. Danielson. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 62-65, 95-97.

Foundry and machine-shop operations in production of specialized motors.

20B-28. Seattle Gear Makers. *Western Machinery and Steel World,* v. 40, Feb. 1949, p. 82-84.

Machine-shop equipment of Western Gear Works.

20B-29. Machining Small Castings. David C. McConnell. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 16-17, 19.

Machining of gray-iron castings for washing-machine transmission parts.

20B-30. The Production of Taper Pins, Grooved Pins and Keys. *Machinery* (London), v. 74, Feb. 3, 1949, p. 137-139.

20B-31. High-Speed Milling of Threads in Armour Plate. *Machinery* (London), v. 74, Feb. 3, 1949, p. 142-144.

Attachment by use of which single-lead modified buttress threads having outside diameters of 1.87 to 4.22 in. can be milled in armor plate up to 14 in. thick. It can be fitted to a standard drilling machine or a portable, multi-spindle, rotary turret head.

20B-32. The Machining of Stainless Steel. Part II. Lester F. Spencer. *Steel Processing,* v. 35, Feb. 1949, p. 82-85, 98.

Recommended procedures, based on survey of the literature. Corrosion resistance of free-machining stainless compositions in comparison to the usual grades. 14 ref.

20B-33. How to Grind Medium-Pitch Gears. D. W. Dudley. *American Machinist,* v. 93, Mar. 10, 1949, p. 94-97.

Suggestions based on experience in grinding precision aircraft gears.

20B-34. Pairs of Quick-Acting Fixtures Speed Broaching of Radii and Slots in Steel Components for Buick Dynaflow Converter. Herbert Chase. *Steel,* v. 124, Mar. 7, 1949, p. 110-111.

20B-35. Mass Production Flow Adapted to Small Lot Production. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 123-124, 126-128, 130.

Manufacture of slush pump valves, piston rods, and other drilling equipment.

20B-36. Spline Broaching Facilitated by Using Special Indexing Fixture. *Machinery* (American), v. 55, Mar. 1949, p. 190.

20B-37. New Tooling Boosts Output on Automatic Screw Machine. *Production Engineering & Management,* v. 23, Mar. 1949, p. 65.

Use of tungsten carbide and faster cutting speeds, made possible by an improved tooling setup, reduces machine cycle time from 90 to 14.7 sec. for production of lightning-arrester plugs from SAE 1020 round bar stock.

20B-38. The Gear Manufacturing Member. Fred H. Trickett. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 102, 105.

Procedures and equipment of Mayvill Gear Mfg. Co., Los Angeles.

20B-39. Machining Large Spherical Roller Bearings. *Machinery* (London), v. 74, Mar. 10, 1949, p. 291-294.

Methods and equipment at SKF Industries in the U. S.

20B-40. Zerspanungseigenschaften bleihaltiger und bleifreier Automatenstähle. (The Machinability of Lead-Containing and Lead-Free Free-Machining Steels.) Alexander Schepers and Richard Krauss. *Stahl und Eisen,* v. 68, Feb. 26, 1948, p. 90-91; discussion, p. 91-92.

Reviews recent German research. Compares properties of a soft leaded steel and high speed high-sulfur steels.

20B-41. Special Equipment Finishes Old's Rocker Arms. Chester Ricker. *American Machinist,* v. 93, Apr. 7, 1949, p. 116-117.

Equipment and procedures.

20B-42. Using Welded Construction for an 18-Spindle Automatic Boring, Forming and Drilling Machine. E. M. Barrett. *Machine and Tool Blue Book,* v. 45, Apr. 1949, p. 138-143.

20B-43. Ingenious Tooling Solves Broaching Problems. A. E. Rylander. *Tool Engineer,* v. 22, Apr. 1949, p. 31.

How broaching after assembly insures stay-put accuracy of steel and cast-iron mating parts of typewriter-carriage guides.

20B-44. Tool and Cutter Geometry. Carl F. Benner. *Tool & Die Journal,* v. 15, Apr. 1949, p. 62, 64-66.

Sketches and tables comparing common design characteristics such as relief and clearance angles on various tools of the same type. Design features of each tool.

20B-45. Work Size Control on Machine Tools. *Machinery* (London), v. 74, Mar. 24, 1949, p. 366-367.

British system of machine control using air-operated gaging equipment. High accuracy and magnification can be obtained.

20B-46. Speed Engraving—Glass Molds. *Ceramic Industry,* v. 52, Apr. 1949, p. 104-105.

Lathe attachment for producing a wide variety of shapes and contours—inside and outside—with precision and speed. A pattern can be repeated up to 92 times on the circumference of a mold, and in various sizes.

20B-47. Hot Milling: Milling High Strength Alloys at Elevated Temperatures. A. O. Schmidt. *Iron Age,* v. 163, Apr. 28, 1948, p. 66-70.

Experimental work involves heating the work to be machined to 1000-1500° F. and machining at those temperatures. Definite reductions in power requirements, faster cutting speeds and feeds, and good tool life. The technique of hot milling, methods of application of heat to the workpiece, cutting speeds and feeds, and various other results of extensive investigations. Data are confined to various high-strength steels.

20B-48. Machining Axles at Ford at Speeds up to 830 sfpm. Thomas E. Lloyd. *Iron Age,* v. 163, Apr. 28, 1948, p. 72-77.

Ford Motor Co. has raised cutting speeds to 830 surface ft. per min. with good tool life in machining some details of a hardened steel axle. Still higher speeds are being tested. Machine and tooling details and operating data.

20B-49. High Production Turning of Rough Forgings. *Automotive Industries,* v. 100, May 1, 1949, p. 46, 67.

Two examples of above applied to alloy-steel automotive parts.

20B-50. A Conical Boring Head. S. N. Filonenko. *Engineers' Digest,* v. 10, Jan. 1949, p. 25-26. Translated and condensed from *Stanki i Instrument* (Machine Tools and Instruments), No. 4, 1948, p. 22-23.

Design and advantages.

20B-51. Steel Castings Carry the Load. H. M. Stoneham. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 62-65, 85.

Production of cast-steel truck-trailer axle assemblies. Machine-shop and foundry procedures.

20B-52. The Production of Engines for the Standard Vanguard. *Machinery* (London), v. 74, Apr. 14, 1949, p. 467-477.

Machine-shop equipment and procedures for British automobile.

20B-53. Crankshaft Grinding With Multiple Wheels. *Machinery* (London), v. 74, Apr. 21, 1949, p. 520-521.

Procedure.

20B-54. New Departure's Sandusky Plant—An Epoch in Sixty Years of Progress. *Production Engineering & Management,* v. 23, May 1949, p. 49-56.

Equipment and procedures for production of precision-made ball bearings. Inspection, materials handling, and hardening procedures.

20B-55. Cylinder Machining Time Cut More Than Half. Robert F. Stucker and Raymond Fogarty. *Modern Machine Shop,* v. 21, May 1949, p. 146-148, 150.

The machining of locomotive cylinders in the South Louisville terminal shops of the L. & N. R. R. is cited as an example of savings in both set-up and machining time made possible when a single machine is employed to perform a variety of operations.

20B-56. NATCO Holeway Cylinder Block Processing Machine. R. A. Schafer. *Machine and Tool Blue Book,* v. 45, May 1949, p. 103-119.

Machine which drills, reams, chamfers, and taps 56 cylinder blocks per hour. Its station-by-station operation; indexing, locating, and clamping circuit; tapping units.

20B-57. "Automation." N. L. Bean. *Mechanical Engineering,* v. 71, May 1949, p. 389-390, 394.

As applied to the production of valve-guide bushings. From the first machine operation right through all operations including inspection, practically all work is carried on automatically. Impact of this revolutionary system on industrial production as a whole.

20B-58. Scroll Chuck Parts Need Versatile Tooling. George Kluter. *American Machinist,* v. 93, May 5, 1949, p. 98-100.

Tooling for these precision parts.

20B-59. Special Cutters Mill Filleted Keyways. W. F. Burchfield. *American Machinist,* v. 93, May 5, 1949, p. 117.

Double the life is secured from marine shafts if sharp, internal corners are avoided.

20B-60. Indexing Fixtures and Automatic Cycling Cut Production Costs on Dynaflow Parts. Herbert Chase. *Steel,* v. 124, May 9, 1949, p. 98-101.

20B-61. Friction-Sawing Facts and Figures. H. J. Chamberland. *Engineers' Digest,* v. 10, Jan. 1949, p. 23-25.

Friction-cutting of various steels by the band-saw method. Production data and saw-control factors.

20B-62. Machining Motor Car Cylinder Heads and Bearing Caps. *Machinery* (London), v. 74, Apr. 28, 1949, p. 539-545.

Equipment and procedures used by British firm.

20B-63. Chucking Automatic Combines Machining, Assembly Operations. *Screw Machine Engineering,* v. 10, May 1949, p. 40-43.

As applied to a typical example: a cast-iron starter housing which, in addition to general machining operations, requires that a bushing be pressed into the front end and bored out in relation to both the face and diameter of the rear tenon.

20B-64. Roll Machining Time Cut Two-Thirds by Template Controlled Lathe. *Steel,* v. 124, May 16, 1949, p. 96.

20B-65. Friction Bandsawing. *American Machinist,* v. 93, May 19, 1949, p. 141, 143.

Transforms high surface speed of the disk periphery to the edge of a rapidly moving bandsaw blade. Advantages and applications.

20B-66. (Book.) **Jigs, Tools and Fixtures. Ed. 4.** Philip Gates. 215 pages. The Technical Press, Ltd., Gloucester Road, Kingston Hill, Surrey, England. 17s. 6d.

Deals with drill jigs, milling fixtures, chucks and turning equipment, cutters, screwing equipment, gages, press tools and cams. Use of magnetic and pneumatic fixtures and materials used in jigs, tools and fixtures. Design aspects and standardization. Representative examples.

20B-67. Machining Connecting Rods for the Standard Vanguard; Methods Employed at the Canley Works of the Standard Motor Co. *Machinery* (London), v. 74, May 5, 1949, p. 579-586.

20B-68. Boring Tractor Housings. *Iron Age,* v. 163, May 26, 1949, p. 70-71.

Special boring machines for the job.

20B-69. Production of Chain Wheels; Methods Employed at the New Cardiff Works of the Renold and Coventry Chain Co., Ltd. *Machinery* (London), v. 74, May 12, 1949, p. 615-621.

Machine-shop procedures and equipment.

20B-70. The Manufacture of Crankshafts and Camshafts. *Machinery* (London), v. 74, May 19, 1949, p. 651-659.

20B-71. Flywheel Production for the Standard Vanguard; Methods Employed at the Canley Works of the Standard Motor Co. *Machinery* (London), v. 74, May 26, 1949, p. 687-694.

20B-72. Dam Drills Guided by Spider & Cam. *American Machinist,* v. 93, June 2, 1949, p. 93.

Set-up for cutting small V-grooves on the faces of conduit sections for the 96-in. outlet gates for Shasta Dam. A routing technique permitted finishing each flange in 6-8 hrs. instead of 48 hrs. by conventional methods.

20B-73. Floating Holders Simplify Roller Burnishing, Elmer Neumann. *American Machinist,* v. 93, June 2, 1949, p. 102-104.

Burnished radii were necessary to stop fatigue failures in tractor shafts.

20B-74. Machining Malleable Iron. Milton Tilley, W. M. Albrecht, L. R. Spann, and J. H. Lansing. *Iron Age,* v. 163, June 2, 1949, p. 72-76.

Machining rates and techniques. Illustrated by data for a number of typical castings on feeds, speeds, tool material, coolant, and output.

20B-75. Tracer Control Simplifies Roll Turning. *Iron Age,* v. 163, June 2, 1949, p.123.

20B-76. Turning Steel-Mill Rolls at High Speed. *Machinery,* v. 55, June 1949, p. 202-203.

Turning of chilled cast-iron and steel rolls for steel mills at speeds as high as 110 surface ft. per min. has been made possible through development of a specially designed tracer-controlled engine lathe.

20B-77. Chip Removal. *Machine Design,* v. 21, June 1949, p. 106.

Device using air suction. Compressed-air supply passes through a jet into a venturi, creating suction. Designed for use on a Gifford drill spindle, this device is useful only for drilling into flat-finished cast-iron surfaces to a maximum hole depth of 1 in.

20B-78. New Engine Lathe Slashes Machining Time on Steel Mill Rolls. *Machine and Tool Blue Book,* v. 45, June 1949, p. 107-112.

20B-79. Machining Scale Knife Edges and Bearings. O. S. Carliss. *Iron Age,* v. 163, June 9, 1949, p. 50-54.

Methods used for grinding and testing these toolsteel parts, as well as milling operations in cutting the dovetail seats into which the edges fit.

20B-80. A Fixture for Continuous Milling. *Iron Age,* v. 163, June 9, 1949, p. 55.

Designed for machining a cast-iron machine part known as a traverse frame dog segment.

20B-81. Precision Machined Hydraulic Parts. Palmer Nicholls. *Western Machinery and Steel World,* v. 40, May 1949, p. 94-95.

20B-82. Milling High-Strength Alloys at Elevated Temperatures. A. O. Schmidt. *Engineers' Digest,* v. 10, May 1949, p. 169-171.

Previously abstracted from *Iron Age,* item 20B-47, 1949.

20B-83. Investigation of Optimum Geometric Form of Cutting Edges Used in Milling Machines for Rapid Machining of Stainless Steels Zh1 and Zh2. (In Russian.) G. Z. Matshin and P. N. Pobegalov. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan. 1949, p. 18-20.

On the basis of experimental investigation, optimum cutting-tool geometry and hard-alloy tip are recommended for the above as well as optimum operating speeds.

20B-84. Machining Properties and Wear of Milling Cutters. (In English.) Olov Svahn. *Acta Polytechnica* (Mechanical Engineering Series), v. 1, no. 7, 1949, 104 pages.

Investigations were made on machining of steel with cylindrical milling cutters. Variable cutting force was measured with capacitive equipment and photographically recorded. 57 ref.

20B-85. Milling Cutter Design and Operation. Part One. Mario Martellotti. *Tool Engineer,* v. 22, June 1949, p. 17-20.

Types of milling cutters, cutting materials and fluids, tooth-and-chip space, cutting angles, and rake angle.

20B-86. Alternating Milling Setup Turns Out Gear Blanks Continuously. Paul Bludau. *American Machinist,* v. 93, June 16, 1949, p. 103.

For tractor steering mechanisms.

20B-87. Broaching Fixture Accommodates Six Different Parts. Elmer Neu-

man. *American Machinist,* v. 93, June 16, 1949, p. 104-105.

Novel fixture with permanent locator stations mounted on an indexing faceplate, used on a 15-ton horizontal broaching machine which has reduced setup time to a minimum.

20B-88. Broaching Steering Knuckles. *Iron Age,* v. 163, June 16, 1949, p. 83.

Solution of problem of broaching two well separated bores accurately in line in forged-steel steering knuckles.

20B-89. Danger—High Voltage! Paul Graham. *Western Machinery and Steel World,* v. 40, June 1949, p. 70-74.

Production of high-voltage circuit-breaker mechanisms, using press and machine-shop equipment.

20B-90. "Crush-Dressing" Technique Used in Production. *Western Machinery and Steel World,* v. 40, June 1949, p. 84-85.

Equipment and procedure developed to make meshed cutting wheels of precise dimensions, of 12 in. diam., and having 660 teeth each. The wheels are used for manufacture of aluminum window screen of the venetian-blind type by rolling sheet through a gang of the wheels.

20B-91. Big Jobs From Portland's Shops. Hal Cooley. *Western Machinery and Steel World,* v. 40, June 1949, p. 88-89.

Large-sized machining jobs.

20B-92. Contour Roll Turning. S. A. Brandenburg. *Iron and Steel Engineer,* v. 26, June 1949, p. 83-85; discussion, p. 85.

New roll lathe uses a thin sheet-metal templet and follower to guide the cutting tool.

20B-93. The Production of Gears for the Standard Vanguard. *Machinery* (London), v. 74, June 9, 1949, p. 759-764.

Procedures and equipment for British car.

20B-94. Broaching Automotive Door Hinges. *Iron Age,* v. 163, June 23, 1949, p. 81.

20B-95. Unusual Turning Jobs Performed on Lathes, Using Proper Tool, Mounting and Suitable Fixture. Herbert Chase. *Steel,* v. 124, June 27, 1949, p. 65, 94.

Two unusual lathe jobs performed in fabricating components for hay balers. One is machining a track cam of irregular contour; the other turning the crank pin.

20B-96. Don't Fear Threading of Stainless. J. J. Robert. *American Machinist,* v. 93, June 30, 1949, p. 71-73.

High output rates and uniform quality may be obtained by careful selection of equipment and tool materials and special attention to operator training.

20B-97. Radiator Sections Machined Automatically. Walter Rudolph. *American Machinist,* v. 93, June 30, 1949, p. 77.

Special machines which face, ream, and tap gray-iron radiator castings. An air blast removes chips.

20B-98. Latest Practices in Making Rear Axles. Joseph Geschelin. *Automotive Industries,* v. 101, July 1, 1949, p. 24-27, 62.

Equipment and procedures used by Eaton Mfg. Co.'s Axle Div. Modern transfer machines, automatic lathes, automatic loading devices, and a huge broach for internal gears are among the equipment used.

20B-99. Smart Tools Bore Heavy Cylinders. J. F. Stevenson. *American Machinist,* v. 93, July 14, 1949, p. 94-95.

Application of the split-pilot principle to a turret lathe set-up enables production tolerances of 0.002 in. to be maintained on deep-hole boring of high-tensile iron cylinder liners. Bores are being machined with only one rough and one finishing cut.

20B-100. Influence of Steel Hardness in Face-Milling. J. B. Armitage and A. O. Schmidt. *Transactions of the American Society of Mechanical Enginers,* v. 71, July 1949, p. 413-419.

Results of face-milling tests on seven different kinds of steels for power consumption and tool life at hardnesses of approximately 200, 300, and 400 Brinell. At any given hardness, power requirements varied but little, but differences in tool life were considerably greater. The hardness of steel can be used as a guide in choosing preliminary values of cutting speed and feed. Photographs illustrate development of wear on a tungsten-titanium carbide milling tooth when milling steel of 200, 300, and 400 Brinell hardness.

20B-101. Constant-Pressure Lathe Test for Measuring the Machinability of Free-Cutting Steels. F. W. Boulger, H. L. Shaw, and H. E. Johnson. *Transactions of the American Society of Mechnical Engineers,* v. 71, July 1949, p. 431-438; discussion, p. 438-446.

A machinability testing method developed during a cooperative research program at Battelle Memorial Institute sponsored by Carnegie-Illinois Steel Corp. The test evaluates materials on the basis of the

feed resulting from a fixed horizontal tool pressure. Its advantage is that it requires only a short testing time. The method is sensitive and gives adequate reproducibility. 10 ref.

20B-102. Rear Axle Housing Production. *Machinery* (London), v. 74, June 16, 1949, p. 795-802.

Machine-shop methods and equipment used by British firm.

20B-103. Buick's New Setup for Tripled Dynaflow Production. Joseph Geschelin. *Automotive Industries,* v. 101, July 15, 1949, p. 26-29, 56.

Some recently developed equipment and procedures, including selective flame hardening of the hub, several machining operations, and assembly.

20B-104. High Speed Automatic Broaching. *Automotive Industries,* v. 101, July 15, 1949, p. 41.

Broaching of splines on automobile window-regulator crankshafts at the rate of 1500 per hr. using a Denison oil-hydraulic Multipress equipped with an automatic indexing table.

20B-105. Special Machine for Drilling and Tapping Cross Members. *Automotive Industries,* v. 101, July 15, 1949, p. 44.

Unusual example of the application of automatic methods for the machining of large and unwieldy parts with locating surfaces at odd angles. It consists of the drilling and tapping of passenger-car-frame front cross-members composed of welded steel stampings.

20B-106. Chuck Pinions Sliced From Cold Drawn Stock. *Product Engineering,* v. 20, July 1949, p. 101.

Substitution of pinion-rod sections for machine-cut pinions in the Wahlstrom automatic drill.

20B-107. Close Tolerances Held on Bull Gears. *Production Engineering & Management,* v. 24, July 1949, p. 43.

Machining of turbine-driven ship bull-gear at Westinghouse's Sunnyvale, Calif., plant.

20B-108. Machining Heavy Workpieces on Relatively Light Machine Tools. *Machinery* (London), v. 74, June 23, 1949, p. 840-841.

Shows possibility by suitable adaptation and choice of speeds and feeds, of successfully precision machining comparatively large batches of work. As an example, the complete machining of forged steel connecting rods for marine diesel engines is described.

20B-109. Indexing Press Tool for Piercing Louvres. *Machinery* (London), v. 74, June 23, 1949, p. 846-847.

Use of a Taylor & Challen No. 1632 ratchet gear piercing press for piercing louvres in a mild steel air-cleaner top cover.

20B-110. The Manufacture of the Dynaflow Transmission. Fred C. Pyper and A. G. MacDougall. *SAE Quarterly Transactions,* v. 3, July 1949, p. 461-472.

A few of the machine operations that are required in the manufacture of the components of the above. To meet the requirements for accuracy at a sufficiently high volume to reach the projected schedule, it was necessary to purchase 493 new machines, and to relocate, retool, and, in some cases, rework 180 machines. In addition, a large amount of foundry equipment, forge and sheet metal presses, and automatic screw machines were retooled.

20B-111. Broaching "Christmas-Tree" Forms in Turbine Wheels. *Tool Engineer,* v. 23, July 1949, p. 33.

53 "Christmas-tree" shaped slots are broached in the periphery of an 11¾-in. diam., Type 316, stainless-steel turbine wheel.

20B-112. Machining Landing-Gear Parts for Huge Modern Bombers. R. E. Greenough. *Machinery,* v. 55, July 1949, p. 200-204.

Close tolerances, smooth surface finish, maximum strength, and a high degree of uniformity are required.

20B-113. A Pictorial Study of Gears. *Western Machinery and Steel World,* v. 40, July 1949, p. 92-93.

Some of the machine tools used and gears produced.

20B-114. The Manufacture of Split Roller Bearings. Michael S. Johns. *Machinery Lloyd* (Overseas Edition), v. 21, July 2, 1949, p. 106-107, 109, 111-112.

Machine-shop procedures of a British firm.

20B-115. Machining Stainless Steels. Lester F. Spencer. *Iron Age,* v. 164, July 7, 1949, p. 83-89; July 28, 1949, p. 64-68.

Previously abstracted from *Steel Processing,* items 20B-15 and 20B-32, 1949.

20B-116. Machining Cylinder Blocks for the Land-Rover. *Machinery* (London), v. 75, July 7, 1949, p. 3-9.

Equipment and procedures for production of British all-purpose agricultural vehicle.

20B-117. Fast Machining of Brake Bands. *Iron Age,* v. 164, July 14, 1949, p. 106.

Production for Buick from solid

rings 1¾ in. wide, $\frac{9}{16}$ in. thick, and 7 in. diam.

20B-118. Huge Marine Bull Gears Machined to Close Tolerances. *Steel,* v. 125, July 18, 1949, p.121.

Although the gears are 146 in. in diam., tolerances are held to 0.0003 in.

20B-119. Hot Spot Machining at Work Temperatures of 500, 1000 and 1500° F. Sam Tour and L. S. Fletcher. *Iron Age,* v. 164, July 21, 1949, p. 78-89.

Results of investigations of the above indicate a technique of substantial significance for increasing metal removal rates. By localized heating of the workpiece just ahead of the point of machining, machinability of metals is radically increased, power consumption is reduced, tool life is improved, and part finish is excellent. Details of turning carbon and alloy steels and high-Co high-Cr refractory alloys.

20B-120. Machining Diesel Engine Fuel Pump Parts. John Linn. *Iron Age,* v. 164, July 28, 1949, p. 44-47.

Outstanding machining and grinding operations for pump components emphasizing close tolerances and gaging methods.

20B-121. Choose Your Steel for Better Machinability. *American Machinist,* v. 93, July 28, 1949, p. 97-98. From paper by M. Eugene Merchant and Norman Zlatin.

Surveys principles of selection and basic reasons for free-machining properties. (See abstract of *American Society for Metals,* Preprint 21, 1948, 20b-72, 1948.)

20B-122. Valve Guide Bushings by Simplified Method. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 41, 60.

Unique method. The practice is to start with cast-iron rods of proper length, rough centerless ground, then finish all over in a six-spindle automatic.

20B-123. Automatic Balance Milling of Connecting Rods. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 46.

Equipment used by Reo in production of its six-cylinder, valve-in-head, Gold Comet engine.

20B-124. Basic Principles of Efficient Machining of Austenitic Heat-Resistant Steel, Type EI69. (In Russian.) N. N. Zorev. *Kotloturbostroenie* (Boiler and Turbine Manufacture), Jan.-Feb. 1949, p. 24-31.

Causes of low machinability of austenitic Cr-Ni steel (composition given). Optimum conditions for machining.

20B-125. Producing Wright Piston and Jet Engines With High-Production Equipment. *Machinery,* v. 55, July 1949, p. 176-181.

Machining operations. (To be concluded.)

20B-126. The "Finroc" Gear Shaving Process. *Engineer,* v. 188, July 15, 1949, p. 77-79.

New process and equipment developed. The "Finroc" system is claimed to be the only process which succeeds completely in removing the undulations formed on the teeth of helical gears cut on the hobbing machine. The claim is also made that the system results in a greater degree of correction as regards errors in profile, pitch, helix angle, and surface finish.

20B-127. Speeds and Feeds for Machining Stainless-Steel Bars. *Machinery,* v. 55, Aug. 1949, p. 221.

Various types of alloy and various operations.

20B-128. Principles of Contour Turning and Boring as Applied in the Machining of Tool Joints and Drill Pipe. Cecil Clark. *Tool Engineer,* v. 23, Aug. 1949, p. 36-37.

Equipment and procedures. Salient features.

20B-129. Percival Prince. Part II. Pre-Assembled Skin-Panels; Fuselage Fixtures and Assembly; Wing Structure and Assembly; Wooden Fixtures. S. C. Poulsen. *Aircraft Production,* v. 11, Aug. 1949, p. 254-261.

Concluding installment on production methods. Methods and tooling for assembling the fuselage, and wing construction, tooling, and assembly procedure for the wings.

20B-130. Costs Cut with Modern Tooling at Cleco's New Texas Plant. C. H. Elliott. *Production Engineering & Management,* v. 24, Aug. 1949, p. 61-65.

Recent developments in machine tools are establishing higher standards of efficiency for the production of pneumatic tools.

20B-131. New Chemical Coolant Prevents Corrosion. Karl F. Hager and Morris Rosenthal. *American Machinist,* v. 93, Aug. 25, 1949, p. 87-89.

Development of a German wartime process has produced a corrosion-inhibiting coolant effective in 0.2% solution in water. Test-sample photographs show lack of corrosion when the inhibitor is used.

20B-132. Cutting Stainless by Friction Band Sawing. H. J. Chamberland. *Iron Age,* v. 164, Sept. 1, 1949, p. 77-79.

Speeds and techniques for cutting solids and tubes, as well as limitations of the process.

20B-133. Turn-Milling Crankshafts at High Production Rates. Herbert Chase. *Automotive Industries,* v. 101, Sept. 1, 1949, p. 40-43, 68, 70.

How Cadillac machines crankpins,

main-bearing journals, cheeks, and counterweights on latest equipment.

20B-134. Gear Production; Investigation Into Problems of Cutting and Finishing. H. Pearson. *Automobile Engineer,* v. 39, Aug. 1949, p. 311-315.

Variables are material to be cut; material of cutter; relief angles of cutter; top rake of cutter; surface finish of relieved and active surfaces of cutter; cutting speed; rate of feed; thickness of cut; and nature of coolant. Steel with 0.05% C was used throughout.

20B-135. Saw Engineering Specialists. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Aug. 1949, p. 58-61.

Saw-conditioning equipment and its operation.

20B-136. Giant Machine Functions as Miller and Planer. *Steel,* v. 125, Sept. 12, 1949, p. 125.

Machine is capable of shaving a sliver 0.0001 in. thick from a steel block the size of a railroad box car.

20B-137. Impact Milling with Cemented Carbide. K. Lippacher. *Machinery* (London), v. 75, Aug. 11, 1949, p. 192-193.

Process and results for 0.45% carbon steel. Cutter design.

20B-138. Latest Machining Methods Applied to Reo Gold Comet Engine Parts. Joseph Geschelin. *Automotive Industries,* v. 101, Sept. 1, 1949, p. 32-37, 64; Sept. 15, 1949, p. 38-41, 58, 86.

Part I follows the cylinder head and block through their various machining stages, while Part II gives a sampling of operations on the piston, connecting rod, and crankshaft.

20B-139. Internal Grinding Rate Doubled on Cam Rings. *Iron Age,* v. 164, Sept. 15, 1949, p. 77.

Rates on cam-ring internal grinding have been doubled by use of a Heald Size-Matic centerless internal grinder in place of the chucking type previously used in production of Buick Dynaflow transmissions.

20B-140. Locating Surfaces Broached Simultaneously. *Production Engineering & Management,* v. 24, Sept. 1949, p. 64.

Close-tolerance machining of the crank end of automotive connecting rods and caps.

20B-141. Broaching Solves Problem on Turbine Wheel Slots. *Production Engineering & Management,* v. 24, Sept. 1949, p. 65.

How slots in Type 316 stainless steel gas turbine wheels are rough and finish cut to extremely close tolerances in one setup on a standard 10-ton American broaching unit.

20B-142. Precision Boring a Better Product at Lower Cost. Rupert Le Grand. *American Machinist,* v. 93, Sept. 22, 1949, p. 121.

Important manufacturing and product improvements by precision-boring shaft holes in transmission cases, using a DeVlieg 3-B Jigmil. As compared to previous methods, the time savings range up to 40%. Other advantages.

20B-143. Speeds for Machining Steel With Carbide Dies. *Tool Engineer,* v. 23, Sept. 1949, p. 53. Reprinted from the Carboloy Tool Manual, Carboloy Co.

A nomographic chart.

20B-144. High Performance Milling Tests. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 89.

Test of new Cincinnati No. 5 dual-power plain milling machine. With a ¼-in. depth of cut and a spindle speed of 219 r.p.m., the machine pulled 107 hp. when the feed reached 50 in. per min. No chatter was detectable at this or any other setting.

20B-145. Precision Boring of Transmission Parts. *Iron Age,* v. 164, Sept. 29, 1949, p. 72.

Setup for drilling six holes in SAE 5140 steel forgings used in Buick Dynaflow transmissions.

20B-146. The Production of Domestic Refrigerators. *Machinery* (London), v. 75, Sept. 8, 1949, p. 331-340.

Machine-shop procedures and equipment.

20B-147. Milling Locomotive Piston Valve Liners. *Machinery* (London), v. 75, Sept. 8, 1949, p. 345-346.

Example of use of hydraulic tracer control on standard or semi-standard machines, for profile milling operations which have previously required highly specialized equipment.

20B-148. Grinding Problems. A. S. Rakestraw. *Foundry,* v. 77, Oct. 1949, p. 95, 184, 186, 188, 190, 192.

Questions relating to foundry costs, applicable to the mechanics of grinding, and having to do with application of grinding wheels for specific jobs.

20B-149. Flexible Setup for Producing Cylinder Sleeves. *Automotive Industries,* v. 101, Oct. 1, 1949, p. 34-35.

Machining and heat treating operations at the Sealed Power plant, Rochester, Ind.

20B-150. Special Machine Has Output of 120 Exhaust Manifolds Per Hour. *Automotive Industries,* v. 101, Oct. 1, 1949, p. 45.

Unique five-station machine built for Ford Motor Co., by Ex-Cell-O Corp.

20B-151. Adjustable Drill Table In-

creases Output. *Production Engineering & Management,* v. 24, Oct. 1949, p. 69.

Use for drilling different types and sizes of holes in various steel plates and housings.

20B-152. Steering Knuckles for Cars Turned and Faced in One Operation. *Machine and Tool Blue Book,* v. 45, Oct. 1949, p. 128-132.

Lathe operation.

20B-153. Determining Cutting Tool Temperatures. Y. C. Lee. *Tool Engineer,* v. 23, Oct. 1949, p. 32-33.

Experimental procedure and results obtained for cast iron, using two types of cutters. Temperatures were determined at 30-sec. intervals.

20B-154. Broaching Connecting Rods. *Iron Age,* v. 164, Oct. 13, 1949, p. 73.

Automotive caps and rods made from separate forgings will match in final assembly by the broaching setup shown. Both side faces of both the rod and cap are straddle broached simultaneously on a 10-ton, 54-in. stroke, dual-ram surface broaching machine.

20B-155. Machining and Martempering 100 Diesel Cylinder Blocks Per Hour. Joseph Geschelin. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 32-34.

Equipment and procedures.

20B-156. Buick Converts to Transfer Line for Water Pump Bodies. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 40-42.

20B-157. Die Sinking for Drop Forging. Part V. Die Sinking. John Mueller. *Steel Processing,* v. 35, Oct. 1949, p. 542-543, 564-565.

Precision machine-shop work of the "die sinker", a skilled craftsman who prepares and maintains drop-forging-hammer dies.

20B-158. Hot Milling Possibilities. A. O. Schmidt and J. R. Roubik. *Automotive Industries,* v. 101, Nov. 1, 1949, p. 28-31, 67.

Four different ways to machine heated workpieces. Reduction in power requirements when the workpiece is heated. Other factors involved.

20B-159. The Manufacture of Radial Flow Steam Turbines. *Machinery* (London), v. 75, Oct. 6, 1949, p. 475-484.

Machine-shop methods and equipment used by British firm.

20B-160. Honing Process Improved With Water Soluble Coolant. *Production Engineering & Management,* v. 24, Nov. 1949, p. 59-60.

Process has cut production cost and reduced time for honing cylinder bores at Studebaker Corp.

20B-161. Motor-Frame Slotting Handled by Keyseater. Harold C. Andree. *American Machinist,* v. 93, Nov. 17, 1949, p. 97.

Procedure, substituted for conventional milling when a limited quantity of large motor frames were slotted to receive stator laminations.

20B-162. Big Tools Machine Massive Cyclotron. *American Machinist,* v. 93, Nov. 17, 1949, p. 98-99.

Picture story of production of Columbia University's new cyclotron by Bethlehem Steel. Includes forging operations.

20B-163. Modern Tooling Methods Employed in Building Cadillac's High-Compression Engine. F. M. Prucha. *Machinery* (American), v. 56, Nov. 1949, p. 146-153.

"Turn-milling" of crankshafts, transfer-machining of cylinder heads and blocks, and unique precision boring setups are among the more interesting features.

20B-164. Transfer Type Machines Produce Reo's "Gold Comet" Truck Engine. A. W. Zimmer. *Machinery* (American), v. 56, Nov. 1949, p. 154-161.

An example of the application of high-production equipment to low-production requirements in order to obtain a more accurate, higher quality product at lower cost.

20B-165. Cost-Cutting Machine Tools Boost Buick's Production. Jesse L. Powers. *Machinery* (American), v. 56, Nov. 1949, p. 162-169.

Increasing automotive production, while reducing costs and improving quality, was made possible by modern machines and tooling methods.

20B-166. Packard's Ultramatic Drive Built by Precision Manufacturing Methods. E. G. Patzkowsky. *Machinery* (American), v. 56, Nov. 1949, p. 170-179.

Extremely smooth surface finishes, a high degree of flatness, and close tolerances are required on many parts of the ultramatic drive. Manufacturing processes developed to build these precision mechanisms economically on a high-production basis. (To be continued.)

20B-167. Experimental Investigation of Honing of Cylinder Bores. (In Russian.) S. M. Kedrov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 6-10.

Experiments were performed on steel and cast-iron cylinders of 90-mm. diameter and 600-mm. length. Method of calculating optimum design of honing machine.

20B-168. Special Fixtures Save Time in Machining Hercules Crankshafts. Rob-

ert Mawson. *Steel*, v. 125, Nov. 21, 1949, p. 92, 94.

20B-169. Special Machinery for Special Work. James Blane. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 74-77, 104-105, 110.

Machine-shop and welding equipment and procedures in fabrication of heavy steel equipment for tunnels, dams, and other large structures.

20B-170. Eliminating Loading Time. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 97.

Solution of the problem of broaching two well-separated bores accurately in line in forged steel steering knuckles.

20B-171. The Production of Motor-Car Pistons; Methods Employed at the Works of Vauxhall Motors, Ltd. *Machinery* (London), v. 75, Nov. 3, 1949, p. 631-637.

Machine-shop equipment and procedures. Use of induction hardening.

20B-172. Centreless Grinding Small-Diameter Work. *Machinery* (London), v. 75, Nov. 10, 1949, p. 679-680.

Use in needle production.

20B-173. 50-Millionths Clearance by Unskilled Workers. Chester S. Ricker. *American Machinist*, v. 93, Dec. 1, 1949, p. 101-103.

How different dimensions, different materials, and different heat treatments are produced rapidly and accurately by unskilled female workers.

20B-174. Developments in Gear Production. H. Pearson. *Engineering*, v. 168, Nov. 4, 1949, p. 487-490. A condensation.

See abstract from *Automobile Engineer*, item 20B-134, 1949.

20B-175. Automatic Recessing Tool. *Production Engineering & Management*, v. 24, Dec. 1949, p. 71.

Use of this tool gave 100% increase in production of heavy steel links.

20B-176. Diesel Manufacture; A Survey of the Production Methods Employed by Dennis Bros. Ltd. *Automobile Engineer*, v. 39, Nov. 1949, p. 477-484.

Miscellaneous machine-shop equipment and procedures.

20B-177. Grinding Small Screw-Cutting Tools. N. V. Samochvalov. *Industrial Diamond Review*, new ser., v. 9, p. 323-324. Translated from *Stanki i Instrument* (Machine Tools and Equipment), no. 7-8, 1946, p. 26-27.

Technique.

20B-178. The Production of Flywheel Ring Gears. *Machinery* (London), v. 75, Nov. 17, 1949, p. 703-708.

Machine-shop, welding, and heat treating equipment and procedure used by British automobile manufacturer.

20B-179. Rapid Machining With Tools Having Negative Rake. (In Russian.) N. D. Morozov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, June 1949, p. 12-14.

Various designs of cutting tools with hard-metal tips for use in machining Cr-Mn-Si steel.

20B-180. Mechanism of Plastic Deformation During Machining of Steel. (In Russian.) S. F. Glebov. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, July 1949, p. 8-11.

A series of experiments in which cutting of polished and etched plates was observed under the microscope. Investigation was conducted with special attention to processes taking place in the zone of simultaneous deformation.

20B-181. Packard's Ultramatic Drive Built by Precision Methods. (Concluded.) E. G. Patzkowsky. *Machinery* (American), v. 56, Dec. 1949, p. 150-154, 163.

Machine-shop equipment and procedures.

20B-182. Low-Cost Production of Parts for Textile Looms. Edward F. Bahan. *Machinery* (American), v. 56, Dec. 1949, p. 166-169.

Miscellaneous setups. Includes flame annealing and tempering and machine-shop operations.

20B-183. Milling Hot Workpieces. A. O. Schmidt and J. R. Roubik. *Tool Engineer*, v. 23, Dec. 1949, p. 17-19.

Results of numerous tests in which the workpieces were heated on the milling machine by means of an oxy-acetylene torch. Heating decreases power requirements and makes possible increased rates. Combined with intermittent cutting (an inherent characteristic of milling) good tool life is obtained with carbides and cast alloys.

20C—Nonferrous

20C-1. Auxiliary Stock Feeding Mechanism. H. G. Abbott. *Screw Machine Engineering*, v. 10, Dec. 1948, p. 35.

Device useful as an aid in obtaining maximum production of parts made from brass on Brown & Sharpe automatics.

20C-2. Machining Sintered Carbide Rings and Tubes; Some German Experiences. P. Popendicker, *Industrial Diamond Review*, New ser., v. 8, Nov. 1948, p. 341.

20C-3. Special Bolt Head Milling Fixture. *Machinery* (London), v. 73, Dec. 9, 1948, p. 806.

A semi-cylindrical surface and two flats are milled on the heads of brass bolts at the rate of three per min., using the fixture shown and a 2-lipped end-mill.

20C-4. Manufacture of Carbide Dies. *Machinery* (American), v. 55, Feb. 1949, p. 170-171.

To simplify the discussion of practices generally adopted in manufacturing carbide dies, the steps followed in building a simple drawing die are described. Begins with boring and grinding operations on the blank and includes surface finishing procedure.

20C-5. How to Machine Beryllium Copper. John T. Richards. *American Machinist,* v. 93, Feb. 10, 1949, p. 101-116.

Current machining practice for the 2% high-strength alloy, which is the one in common use today.

20C-6. Carbide Die Construction. *Tool & Die Journal,* v. 14, Mar. 1949, p. 64, 66.

The four steps generally followed when building carbide dies: the carbide methods of holding and proper support, diamond boring, grinding, and lapping.

20C-7. Producing Square Holes on Multiple-Spindle Automatics. *Machinery* (American), v. 55, Mar. 1949, p. 160-161.

Successive steps in production of brass magnet shaft, which include rolling of the outside diameter to produce a square hole in the stem of the part.

20C-8. Control Factors for Band Sawing Copper and Copper Base Alloys. H. J. Chamberland. *Production Engineering & Management,* v. 23, Mar. 1949, p. 63-64.

Saw life, metal-removal rate, and surface finish have been given careful consideration in establishing the recommendations presented.

20C-9. Improving the Machinability of Aluminum Bronze. Vladimir A. Grodsky. *Metal Progress,* v. 55, Mar. 1949, p. 340-341.

Experimental results indicate that addition of 0.5-1.0% Pb will greatly improve machinability and not reduce, to any appreciable extent, mechanical, heat treating, forging, and welding properties of Al bronze.

20C-10. Slot-Milling Fixture With Automatic Ejector. *Machinery,* v. 55, Apr. 1949, p. 159.

Fixture designed for a high-speed milling machine for milling slots in 3/16-in. diam. brass rods.

20C-11. Production of Air-Cooled Copper Heads for Bristol Sleeve-Valve Engines. Part I. Development of Design and Machining of the Copper Base. *Aircraft Production,* v. 11, Mar. 1949, p. 75-79.

(To be concluded.)

20C-12. Production of Long Brass Tube Successful With Combined Carbide, High Speed Tools. Frank Ungleich. *Screw Machine Engineering,* v. 10, Apr. 1949, p. 27-30.

Fabrication procedure of the above tube.

20C-13. Broaching—A Practical Method for Machining Die Castings. M. E. Engebretson. *Die Castings,* v. 7, May 1949, p. 44-47, 58-59, 62-63.

Methods and tools, and some case histories. Compares broaching with other machining methods.

20C-14. Auto-Feed Loads Couplings Into Headstock Chuck. George E. Fogarty. *American Machinist,* v. 93, June 16, 1949, p. 92.

Procedure.

20C-15. Circular Form Tools Speed Production. *Western Machinery and Steel World,* v. 40, June 1949, p. 103.

Use for manufacture of grooved bronze labyrinth seals for steam turbines.

20C-16. Making and Inspecting Bronze Aircraft-Engine Parts. A. P. McGinnes, Jr. *Machinery,* v. 55, July 1949, p. 182-187.

Especial care is taken in machining to insure dimensional accuracy, and casting methods are closely controlled to obtain a high degree of wear resistance. The alloy used contains 87% Cu, 11% Sn, and 2% Zn.

20C-17. Machining High Nickel Alloys. Gilbert P. Muir. *Tool Engineer,* v. 23, Aug. 1949, p. 38-41.

Modifications of machining and tool design due to differences in properties of Ni alloys from those of low-alloy steels. Tool material, cutting fluid and machining data. Tool-design diagrams.

20C-18. Sintered Carbide Die Construction. *Industrial Diamond Review,* new ser., v. 9, Aug. 1949, p. 232-233.

Procedure used by Allegheny Ludlum Steel Corp.

20C-19. Marking and Index Drilling Operations Complete Part. *Screw Ma-*

chine Engineering, v. 10, Oct. 1949, p. 32-35.

Details of tooling operations for diagrammed part, to be made of free-cutting brass on a B. & S. automatic screw machine.

20C-20. Tooling Methods Cut Production Problems. *Screw Machine Engineering,* v. 10, Oct. 1949, p. 36-39, 41.

For complex Zn die-cast part which must be machined to meet exacting concentricity requirements.

20C-21. Flaring Tools, Tubing, Combine To Effect Large Saving. *Screw Machine Engineering,* v. 11, Nov. 1949, p. 46-48.

Unusual setup used to produce brass tubular part with flared end on the automatic screw machine.

20C-22. Watchmakers' Lathe Adapted for Repetition Work. P. Gates. *Machinery* (London), v. 75, Oct. 13, 1949, p. 534.

Setup for cutting short pieces of nickel tube 0.75 mm. in diam. and 5 mm. long from relatively long lengths in large quantities.

20C-23. Short-Stroke Broaching of Die Castings. H. K. Barton and L. C. Barton. *Machinery* (London), v. 75, Oct. 27, 1949, p. 615-620.

Clarified by schematic diagrams.

20C-24. Influence of the Nature of Metal on Facilitation of the Cutting Process by Use of Adsorbed Substances. (In Russian.) G. I. Epifanov, P. A. Rebinder, and L. A. Shreiner. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 66, June 11, 1949, p. 879-880.

Results of experimental investigation of aluminum, zinc, and bronze using different surface-active agents indicate that the softening action of such agents during plastic deformation of metals depends not only on chemical nature of the agents but also on nature of the metal.

20C-25. Hard, Tough Alloys Can Be Machined. Fred B. Sills. *American Machinist,* v. 93, Dec. 1, 1949, p. 84-85.

How ordinary turning, boring, and drilling operations can replace costly grinding for heavy stock removal on high-temperature alloys by use of carbide-tipped tools.

20C-26. Disk Grinder Face-Mills Small Parts. John C. Hanna. *American Machinist,* v. 93, Dec. 15, 1949, p. 86-87.

How a converted Besly disk grinder with a cutter in place of the usual grinding wheel eliminates normal grinding of small brass, bronze, and Al alloy valve parts before lapping for high finish.

20C-27. Machining Nimonic: Notes Based Upon Current Practice in the Processing of the Wiggin Series of High-Nickel Alloys. *Aircraft Production,* v. 11, Dec. 1949, p. 399-404. **Machining the Nimonic Series of Alloys: Results of a Survey Undertaken by Henry Wiggin & Co., Ltd.** *Machinery* (London), v. 75, Dec. 1, 1949, p. 775-782.

20D—Light Metals

20D-1. New Tools for Sawing and Cutting Aluminum. Arthur A. Schwartz. *Light Metal Age,* v. 6, Dec. 1948, p. 12-13, 19.

20D-2. Development of a High-Speed Lathe for Machining Aluminium. *Machinery* (London), v. 73, Dec. 2, 1948, p. 763-768. A condensation.

See abstract of paper from *Machine Design,* item 20d-2, 1948.

20D-3. L'utilisation des carbures métalliques dans le tournage des alliages légers. (Use of Carbide Tools for Machining of Light Alloys.) Andre Pernollet and René Schweyckart. *Revue de l'Aluminium,* v. 25, Nov. 1948, p. 343-352.

Types of carbides which are particularly suitable for tools for machining of light alloys. Physical and chemical properties of such carbides. Saving in man-hours and cost of machining if such tools are used.

20D-4. Thin-Walled Aluminum Castings Broached to Close Tolerances. *Production Engineering & Management,* v. 23, Jan. 1949, p. 63.

Applied to aluminum typewriter frames.

20D-5. Tallow Grease Used to Lubricate Aluminum-Cutting Tools. Leo M. Carey. *Machinery* (American), v. 55, Feb. 1949, p. 176.

When tapping small holes in very soft aluminum, it was found that the metal gouged the flutes of the tap when conventional fluids were employed. These difficulties led to the trial of a nonabrasive buffing compound as a lubricant. Results were ease of tapping, absence of gouging, and a fine finish on the threads produced. Equally successful results were obtained in drilling small holes and in cutting off thin-walled aluminum tubing with a circular saw.

20D-6. Increase in the Mechanical Strength of Aluminum During Cutting in Inert and Surface-Active Media. (In Russian.) N. A. Pleteneva, L. A. Shreiner, and P. A. Rebinder. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 62, Oct. 11, 1948, p. 653-655.

The mechanism of the strengthening process; experimental methods.

20D-7. Distortionless Broaching Thin-Walled Aluminum Castings at 30 Feet per Minute. *Steel,* v. 124, Mar. 14, 1949, p. 128.

Equipment and procedure.

20D-8. Cutting Costs: Contour Sawing Aluminum. H. J. Chamberland. *Modern Metals,* v. 5, Mar. 1949, p. 17-20.

Six random applications of contour sawing to Al sheet, plate, castings, extrusions, and assemblies.

20D-9. Choosing a File for Aluminum. Stanley Livingston, Jr. *Modern Metals,* v. 5, Mar. 1949, p. 26-28.

Recommendations for obtaining maximum efficiency from files as well as filing production. Types of files to use for specific jobs.

20D-10. Windscreen Castings. *Aircraft Production,* v. 11, Apr. 1949, p. 127-130.

Procedures and equipment for fabrication of the frames for the windshields used on aircraft designed for operation under internal pressure at high altitudes. Machining, routing, and shaping of the Al-alloy castings used.

20D-11. Face Milling and Cutting Schedules for Rapid Working of Silumin. (In Russian.) N. G. Vinogradov and I. M. Dmitriev. *Stanki i Instrument* (Machine Tools and Instruments), v. 19, Dec. 1948, p. 10-11.

Effects of various factors. Composition of alloy is given.

20D-12. Machining Slipper-Type Piston for High Compression Engine. Joseph Geschelin. *Automotive Industries,* v. 100, May 1, 1949, p. 40-41, 78.

Set-ups for machining piston for the 1949 Cadillac V-8 engine. A major problem is that conventional chucking would be sufficient to cause distortion of the skirt. Added to this are the special requirements of the new high-compression engine which demand still closer attention to fine tolerances.

20D-13. Milling Aircraft Wing Skins. T. E. Lloyd. *Iron Age,* v. 163, May 5, 1949, p. 78-80.

Methods and equipment used by North American in production of air foils for its F-86 fighter by contour milling the wing skins. Other possible methods under consideration by the Air Forces.

20D-14. Machining the Vanguard Clutch Housing and Gearbox. *Machinery* (London), v. 74, June 2, 1949, p. 723-728.

Methods employed for machining the above Al-alloy casting.

20D-15. Thin-Wing Construction. The Trend to Integral Structures; Machining Thick Skin Panels for the North American F-86 Fighter. *Aircraft Production,* v. 11, July 1949, p. 227-228.

20D-16. Spindling; Some Metal and Wood-Machining Operations. *Aircraft Production,* v. 11, Aug. 1949, p. 280-282.

Spindling, like its near relative routing, is a woodworking process that has been found equally applicable to the machining of the light-alloys of Al and Mg.

20D-17. Taper-Milling of Aircraft Wing Skins. A. C. Slatter and J. J. Sloan. *Machinery,* v. 55, Aug. 1949, p. 158-161.

Method for economically machining tapered Al-alloy wing and fuselage skins in a variety of shapes.

20D-18. Milling Complex Contours on Multiple-Spindle Machines. *Machinery* (London), v. 75, Aug. 11, 1949, p. 198-199.

A 4-spindle automatic profiling machine and its operation applied to milling Al.

20D-19. Machining Aluminum. *Reynolds Metals Technical Advisor,* no. 11, 1949, p. 3-4.

Specific recommendations for lubricants, coolants, and cutting compounds for turning and for various cuts, speeds, and feeds.

20D-20. Tapered Skin-Plating. Weight Economy; Design and Manufacturing Considerations. *Aircraft Production,* v. 11, Sept. 1949, p. 312-314.

Second article on machining of Al alloy wing skins by North American Aviation. Development work, weight economies, cost, machining practice, and design considerations.

20D-21. Pilot Controlled Machines in Aircraft Industries. E. H. Farmer. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 86-88.

Machines for fabricating aluminum parts at Lockheed Aircraft Corp. include Hydro-Tel milling machine, 16 x 20 Lodge & Shipley copymatic lathe, and No. 340-T Giddings and Lewis horizontal boring and milling machine.

20D-22. Production Jig Boring to Close Tolerances. *Machinery* (London), v. 75, Sept. 22, 1949, p. 411-412.

Machining operations for an aluminum alloy supporting arm at the Moore Special Tool Co., Inc.

20D-23. Centrifugally Actuated Fixture Eliminates Chatter. *Iron Age,* v. 164, Nov. 3, 1949, p. 99.

Fixture used in facing a "reaction flange" (die-cast Al) for Buick Dynaflow transmissions.

SECTION XXI

MISCELLANEOUS FABRICATION

21A—General

21A-1. Master Tooling Dock Proves Time Saver. Bill Edwards. *Western Metals,* v. 6, Dec. 1948, p. 34-35.

Originally applied in the aircraft industry, but now finding widespread application in a variety of industries. It may be described as a universal three-dimensional positioner.

21A-2. Hotpoint Mechanizes Range Production. Ben C. Brosheer. *American Machinist,* v. 92, Dec. 30, 1948, p. 67-70.

Handling equipment is synchronized with production machines for automatic operation as a unit in production of electric ranges.

21A-3. Hawker Sea Fury; Part III. Mainplane Construction; Building the Main Spars; Leading- and Trailing-Edge Sub-Assemblies; Final Assembly. S. C. Poulsen. *Aircraft Production,* v. 10, Dec. 1948, p. 413-422.

Concludes description of equipment and procedures.

21A-4. Excess Spring Stress; Points to be Watched in Spring-Making. *Wire Industry,* v. 15, Dec. 1948, p. 816.

Practical recommendations.

21A-5. Plastic Tooling Comes of Age. Lawrence Wittman. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 47-A-101, 1947, 12 pages.

High-strength, low-pressure-molded, reinforced, plastic laminates have been adopted as standard, in lieu of steel, in many types of aircraft fabricating tools. Material characteristics, design considerations, and adaptability to tooling in other industries.

21A-6. Atomized Alloy Molds. Thomas A. Dickinson. *Plastics* (American), v. 8, Dec. 1948, p. 22-23, 26.

Fabrication of stainless steel and many other types of metallic molds for plastics and related materials by an atomizing and spraying process using the alloy in wire form fed through a "gun" into a gas flame or between electrical heating elements. The alloy is applied as a coating to a pattern of wood, plaster, glass, concrete, thermoplastic, or metal, the pattern being removed later.

21A-7. Some Recent Developments in the Technique of Radio Valve Manufacture. J. W. Davies, H. W. B. Gardiner, and W. H. Gomm. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 352-363; discussion, p. 364-368.

Principles of construction, materials used, and forms and types of various components, cathodes, grids, and anodes. The joining of glass and metal and notes on the machines used. Assembly processes; and tables showing the various types of joining in common use and their application in tube manufacture.

21A-8. New Production Shortcuts Aid Industry in Reducing Costs. Walter F. Toerge. *Steel,* v. 124, Jan. 3, 1949, p. 180-183.

Miscellaneous developments in casting, forging and forming, heat treating, machining, joining, surface treatment, inspection and testing, materials handling, and plant service.

21A-9. Automation: An Outstanding Method of Increasing Production. Nevin L. Bean. *Machinery* (American), v. 55, Jan. 1949, p. 145-151, 167.

System of automatic feeding, unloading and handling of work to, from, and between production machines, developed by Ford Motor Co.

21A-10. Portable 360-Cycle Electric Tools Speed up Automobile Assembly. George H. DeGroat. *Machinery* (American), v. 55, Jan. 1949, p. 156-160.

Typical uses of above for grinding bare metal, polishing, buffing, and various assembling operations, such as drilling, screw-driving, and nut-setting.

21A-11. Detroit. W. G. Patton. *Iron Age,* v. 163, Jan. 6, 1949, p. 248-257.
Some of the development work being conducted in the automobile industry in order to cut production costs.

21A-12. Plastic Tooling Proves Its Worth. Robert McLarren. *Aviation Week,* v. 50, Jan. 10, 1949, p. 20-21.
Substantial savings in aircraft production costs are effected by use of jigs and fixtures fabricated from molded laminates.

21A-13. Compressed Air Facilitates Production of Vacuum Cleaners and Water Coolers. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 88-89.
Compressed-air applications at Interstate Engineering Corp., El Segundo, Calif.

21A-14. Materials Shortages and Rising Labor Costs Force Changes in Manufacturing Techniques. Herbert Chase. *Materials & Methods,* v. 29, Jan. 1949, p. 60-63.
Current practice in three major forming categories: casting; sintering powdered-metal compacts; and mechanical forming from wrought metal shapes. Use of alternate methods to reduce production costs and conserve materials.

21A-15. Three Metallizing Techniques for Component Design. J. C. Lebens. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 120-125, 196, 198, 200, 202, 204.
Advantages, limitations, and applications of printed circuits, hermetic sealing, and electroforming of precision parts for mass-production. Printed circuits are prepared by at least 26 methods which can be grouped into 6 classes: painting, spray deposition, chemical deposition, vacuum deposition, dusting, and die-stamping. 11 ref.

21A-16. Radiator Production Mechanized at Ford Motor "River Rouge" Plant. *Industrial Heating,* v. 16, Jan. 1949, p. 28-30, 32, 34, 36, 38, 40, 138.
Forming, annealing, joining, assembly. (To be continued.)

21A-17. Engineering Intricate Press Parts at Ravenna Metal Products. Howard E. Jackson. *Modern Industrial Press,* v. 11, Feb. 1949, p. 30, 34, 36.
All kinds of metal are worked, in any form, with almost any type of tool. Machining, welding, grinding and polishing are done as well as shearing, drawing, and forming.

21A-18. Modern Production Found at Fawick Airflex Plant. *Modern Industrial Press,* v. 11, Feb. 1949, p. 46, 48, 56.
Production of industrial clutches, brakes, and accessory units at Cleveland plant.

21A-19. Hydraulically Formed Seamless Metal Bellows. *Machinery* (London), v. 74, Feb. 3, 1949, p. 131-136.
Methods for production by a British firm.

21A-20. Sunnyvale Plant Adds Heater Line to Production Schedule. *Western Metals,* v. 7, Feb. 1949, p. 30-31.
Production of water heaters by Westinghouse's Sunnyvale, Calif., plant.

21A-21. Shop Shots at I-T-E Circuit Breaker Co. *American Machinist,* v. 93, Mar. 10, 1949, p. 118-119.
Punch-press, machine-shop, and welding operations.

21A-22. Indian Motocycle Retools for Improved New Models. *Production Engineering & Management,* v. 23, Mar. 1949, p. 55-62.
Methods and equipment.

21A-23. Simplifying Manufacturing Methods With Air-Operated Fixtures. *Machinery* (American), v. 55, Mar. 1949, p. 181-184.
Applications in production of household vacuum cleaners.

21A-24. The Production of Washing Machine Components. *Machinery* (London), v. 74, Mar. 3, 1949, p. 259-263.
Press operations, welding, enameling, spinning, metal spraying, assembly in manufacture of Bendix Home Laundry by British firm.

21A-25. (Book.) **Production Engineering.** J. S. Murphy. Iliffe and Sons, Ltd., Dorset House, Stamford St., London, S.E. 1, England, 12s. 6d. net.
A general survey of technical, personal, and commercial problems involved in the mass production of machine parts, considered from the angle at which the student or planning engineer first approaches the subject. Assumes that the reader is conversant with machine-shop practice. Each sequence is discussed in the order in which it occurs in practice, from preliminary organization of the factory to pricing the product.

21A-26. Costs Cut 50% by Modern Casket-Fabricating Methods. H. A. Neff. *Steel,* v. 124, Mar. 28, 1949, p. 78, 80.
Production methods at two plants of the Belmont Casket Mfg. Co. Forming operations take place at one plant, while the other is used to weld, finish, and assemble the caskets.

21A-27. Manufacturing the Alvis Leonides. *Aircraft Engineering,* v. 21, Mar. 1949, p. 76-84.
Equipment and procedures for

manufacture of Britain's only 500-hp. airplane engine. Design details.

21A-28. Aircraft Fixtures Adapted to Building Bus Bodies. Walter Rudolph. *Automotive Industries,* v. 100, Apr. 1, 1949, p. 42-44, 70.

21A-29. Butt-Marking Tool. *Aircraft Production,* v. 11, Apr. 1949, p. 114.

Simple device for scribing skin panels which aids in accurately fitting them together.

21A-30. Convair: One of the Most Modern Production Lines in the World. Thomas A. Dickinson. *Western Metals,* v. 7, Apr. 1949, p. 28-31.

Production of different airplanes and parts.

21A-31. Special Motors for Special Jobs. *Western Machinery and Steel World,* v. 40, Apr. 1949, p. 82-84.

Production including foundry, finishing, coil-winding, press, and machine-shop operations.

21A-32. Fracturing Connecting Rods Assures Perfect Alignment. *Iron Age,* v. 163, May 5, 1949, p. 81.

"Perfect alignment" rods are made by an unusual method. The rods are forged with a round crank-pin hole, machined and heat treated in one piece. Then the cap is fractured from the rod. The fractured faces of the cap and rod make perfect mating surfaces when re-assembled. The method has been used on hardened-steel and Al-bronze rods for various applications.

21A-33. Assembling Metal Parts by Shrink Fitting. C. Deschars. *Materials & Methods,* v. 29, May 1949, p. 64-67.

Using liquid nitrogen as the cooling medium. Typical set-ups, and nitrogen-consumption and metal-contraction data for a wide variety of metals and alloys.

21A-34. Screws, Rivets and Studs for the '49 Ford. Albert Wright. *Western Machinery and Steel World,* v. 40, May 1949, p. 92-93.

21A-35. Manufacture in German Factories of Steel Strip Bonded With Aluminum. *Metallurgia,* v. 40, May 1949, p. 66.

Procedure consisting of rolling and application of heat.

21A-36. Simplified Tooling With Plastic Laminate. Harry Wilkin Perry. *Aircraft Engineering,* v. 21, June 1949, p. 193-195.

Economical method of tooling. Molding the tools of low-pressure plastic laminate, instead of making them of metal, effected an average time saving of 60% and resulted in savings of more than $100,000 during the first full year the method was employed. Fiberglas woven fabric and resins of the low-pressure, thermosetting type for impregnating the fabric are used for a variety of jigs and fixtures for miscellaneous fabrication processes.

21A-37. How to Choose and Use Portable Tools. Part 4. Standard and Semi-Standard Tools. H. P. Bailey. *American Machinist,* v. 93, June 30, 1949, p. 91-93.

Miscellaneous applications in the machine-shop, foundry, and elsewhere in fabrication and assembly operations.

21A-38. Sheet-Metal Components for Turbo-Jet Engines Require Exact Manufacturing Methods. George H. DeGroat. *Machinery,* v. 55, July 1949, p. 152-159.

Miscellaneous fabrication operations. Forming and other press operations, annealing, welding, and machining. Stainless and low-carbon steel and Nimonic 75 (78% Ni, 20% Cr) are mainly used.

21A-39. Building the Fairchild "Packet" by Advanced Tooling Methods. Arthur D. Jairett. *Machinery,* v. 55, July 1949, p. 168-175.

Various progressive tooling methods, including plastic tooling, universal jogging dies, milling of forgings after assembly, and unique assembly fixtures.

21A-40. Percival Prince. Part I. Basic Production Equipment; Stretch Forming; Soft-Metal Blanking-Tools; Fuselage Construction. S. C. Poulsen. *Aircraft Production,* v. 11, July 1949, p. 218-223.

Operations and equipment applied to a British light passenger aircraft.

21A-41. Metal Working Vital To Production of New Electric Room Heater. Walter Rudolph. *Modern Industrial Press,* v. 11, July 1949, p. 36, 38, 40, 42.

Miscellaneous fabrication and assembly operations. Press operations, welding, machining, as well as an unusual operation consisting of flanging spiral, Ni-Cr ribbons.

21A-42. Planning Production Tooling for Different Product Quantities. John S. Mason. *Production Engineering & Management,* v. 24, Aug. 1949, p. 45-49.

Importance of such factors as "total quantity" and "production rate" when planning tooling for products which are in the development stage.

21A-43. Conveyorized Production of Fractional H. P. Motors. *Production Engineering & Management,* v. 24, Aug. 1949, p. 53-60.

Mechanized handling has greatly increased over-all operating efficiency.

21A-44. Modern Equipment at Work. *Modern Machine Shop,* v. 22, Aug. 1949, p. 146, 148, 150, 152, 154, 156, 158, 160, 162, 164.

Profiling Attachment for a Car-Wheel Lathe; Alvey-Ferguson Rack Washer Assures Clean Racks for Finished Gears; Large Roll Salvaged by Welding with Bronzochrom 185FC; Multipress Used for Three Different Production Jobs; and Broaching Bores in Forged Steel Steering Knuckles.

21A-45. Automatic Machines Assemble Condenser Coils. *American Machinist,* v. 93, Aug. 25, 1949, p. 103.

Picture story shows how mechanization eliminates virtually all manual operations in assembling finned condenser units.

21A-46. The Vital Role of Metals in Producing Electro-Medical Apparatus in the West. C. J. Birtcher. *Western Metals,* v. 7, Aug. 1949, p. 24-25.

A few miscellaneous fabrication procedures and equipment used in production of diathermy machines, electrosurgical instruments, ultraviolet lamps, and other electrical devices used in medicine. Principal alloys used are iron, steel, copper, and aluminum.

21A-47. The Production of Automatic Record Changers; Methods Employed at the Garrard Factory. *Machinery* (London), v. 75, Aug. 4, 1949, p. 147-154.

Machine-shop, and other miscellaneous fabrication and assembly procedures.

21A-48. Australia Produces American-Designed Holden Car. *American Machinist,* v. 93, Sept. 8, 1949, p. 132-134.

Miscellaneous fabrication procedures and equipment.

21A-49. Compressed Air Power Facilitates Manufacture of Aircraft Engines. *Steel,* v. 125, Sept. 12, 1949, p. 126.

Compressed air facilities which supply air to thousands of locations throughout the plant of Wright Aeronautical Corp. A battery of five compound, motor-driven compressors is used.

21A-50. Fuel Cocks; Manufacturing and Testing of the Vickers-Armstrong D and P-Type Units. *Aircraft Production,* v. 11, Sept. 1949, p. 307-311.

Design details, machine-shop and testing procedures.

21A-51. The Manufacture of Sheet-Metal Combustion Equipment for Jet-Propelled Aircraft. L. H. Park. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1935-1946.

21A-52. Trucks for the West. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 90-93.

Manufacture of Peterbilt truck tractor cabs.

21A-53. Forty Years of Filtration. W. H. Oliver. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 94-97.

Manufacture of different types of filters for various industrial operations.

21A-54. Cost Saving Ideas. *Iron Age,* v. 164, Oct. 6, 1949, p. 95-98.

Series of practical cost-saving ideas for the metalworking industry.

21A-55. Design of Fixture Elements: Rests, Stops and Locators. Hans W. Smith. *Tool Engineer,* v. 23, Oct. 1949, p. 20-22.

Fixtures for drilling, milling, forming, welding, and gaging. Their principles are explained by describing their elementary parts.

21A-56. Saunders-Roe Princess. Wilfred E. Goff. *Aircraft Production,* v. 11, Oct. 1949, p. 343-351.

Third of series on manufacture of British "flying boat" includes assembly of the pressure-hull; alignment of mainplane-attachment points; attachment of shell-plating; and riveting.

21A-57. (Book) **How To Cut Production Costs.** H. E. Blank, Jr., editor. 371 pages. 1949. Funk & Wagnalls Co., 153 E. 24th St., New York 10, N. Y. $4.50.

Divided into three sections: Modern Production Methods; Production Techniques and Equipment; and Plant Maintenance, Services, and Working Conditions. Techniques for reducing costs in plants, materials controls, quality and inspection, fabrication, processing, and research. Check charts reveal strong and weak points in existing plant operations.

21A-58. Production Engineering Research Association. D. F. Galloway. *Research,* v. 2, Oct. 1949, p. 471-477.

Work of British cooperative organization of engineering firms. Research on the drilling operation as applied to metals.

21A-59. Modern Equipment at Work. *Modern Machine Shop,* v. 22, Nov. 1949, p. 196, 198, 200, 202, 204.

Crush grinding 4,000 parts per hour; special machine for tapping cylinder blocks; new installation boosts brazing rate; and power brushing used for cleaning shovel blades.

21A-60. Engineered Expansion Pays Off in More Efficient Production. E. F. Ross. *Steel,* v. 125, Nov. 14, 1949, p. 80-82.

How manufacturer of electric and pneumatic portable tools has modified machining, heat treating, finishing, and assembly operations to keep pace with increased volume of business.

21A-61. How To Sell the Western Automotive Industry. *Western Metals,* v. 7, Nov. 1949, p. 25-31.

First of a series of analyses of major western industries which offer strong potential markets to western metalworking plants. Varied equipment and procedures at different western plants.

21A-62. Power Impact Tools Are Key to Lower Assembly Costs. A. G. Ringer. *Fasteners,* v. 6, no. 2, 1949, p. 6-9.

Miscellaneous uses in application of fasteners, or in the tapping of holes.

21B—Ferrous

21B-1. Equipping Industry for Continuous Production. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 84-86.

Manufacture of conveyors.

21B-2. Manufacture of Hoffmann Ball and Roller Bearings. *Engineering,* v. 166, Dec. 3, 1948, p. 535-537, 540; Dec. 10, 1948, p. 560-561, 564; Dec. 17, 1948, p. 582-583.

The methods and equipment used by the above British firm which are believed to be representative of the industry as a whole.

21B-3. Production of Sheet Steel at Irvin Works Modernized. *Blast Furnace and Steel Plant,* v. 36, Dec. 1948, p. 1465-1469.

Includes pickling lines, shearing equipment, annealing furnaces, and handling equipment.

21B-4. Gadgets. *Tool Engineer,* v. 22, Jan. 1949, p. 39-40.

"Warning for Air Pressure Failure" (as applied to air ejection of finished pieces from high-speed presses) Paul H. Winter, "Reservoir Solder Tip", A. J. Pangburn, "Internal Groove Checking," Stanley R. Welling, "Drafting Tool for Serrations," Robert E. Kidd, and "Clamp to Handle Dies," George Hull.

21B-5. Making the Standard Vanguard Body; Plant and Methods Employed at the Works of Fisher & Ludlow, Ltd. *Machinery* (London), v. 73, Dec. 16, 1948, p. 837-845.

Manufacture of British car body.

21B-6. Packaging Flat Rolled Steel. Charles E. Miller. *American Iron and Steel Institute,* 1948, 27 pages.

Typical methods.

21B-7. Packaging Coiled Strip and Wire. Harold F. Jacobsen. *American Iron and Steel Institute,* 1948, 8 pages.

Efficient material handling, bundling, protection against corrosion, wrapping, boxing, palletizing, tagging, marking, and loading and bracing for transportation.

21B-8. The Manufacture of Tin Cans. *Machinery Lloyd* (Overseas Edition), v. 20, Dec. 18, 1948, p. 77-83.

Equipment and procedures.

21B-9. Versatility Spells Success. *Western Machinery and Steel World,* v. 40, Jan. 1949, p. 86-87.

Production of miscellaneous sheet-metal cabinets and tanks.

21B-10. 100 Valve Tappets a Minute. Vincent Trolley. *Iron Age,* v. 163, Feb. 3, 1949, p. 110-115.

Drawing, welding, heat treating, and grinding operations; and material-handling methods at Ford's River Rouge plant. A feature of the line is a progressive die arrangement in a 200-ton mechanical press.

21B-11. Significant Engineering Contributions Made to Steel Fabrication by A. O. Smith Corp. Gerald E. Stedman. *Modern Industrial Press,* v. 11, Feb. 1949, p. 22, 26, 29, 36.

Variety of methods used in various A. O. Smith plants. Press, machine-shop, and welding equipment and procedures.

21B-12. Operations in a Plate Shop. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 43-44.

Press, machining and welding equipment and procedures.

21B-13. Developments in Continuous Butt Weld Pipe Mills. William Rodder. *Iron and Steel Engineer,* v. 26, Feb. 1949, p. 101-109; discussion, p. 109-111.

Shearing, forming, welding, and other coordinated units.

21B-14. Oliver's Modernized Facilities for Producing Three Tractor Models. Joseph Geschelin. *Automotive Industries,* v. 100, Mar. 1, 1949, p. 34-36, 52.

New final assembly building and rebuilt gray-iron foundry of Oliver Corp.

21B-15. Production of Ford Axle Housings. *Machinery* (London), v. 74, Feb. 10, 1949, p. 167-170.

Forming, welding, and machining.

21B-16. Strip-Wound Pressure Vessels. *Engineer,* v. 187, Feb. 11, 1949, p. 155-157.

Design and fabrication. A combination of heating, pressure rolling, and quenching is used during strip winding.

21B-17. Quality Control of Stainless Steel Strip. G. W. Paulin. *Tool & Die Journal,* v. 14, Mar. 1949, p. 74, 76.

Rolling, pickling, annealing, and

tempering procedures at Allegheny Ludlum Steel Corp.

21B-18. Sink Production at American Central. Walter Rudolph. *Finish,* v. 6, Apr. 1949, p. 19-22, 76.
Fabrication, pickling equipment, porcelain enameling, handling, and automatic equipment for packaging.

21B-19. Alkaline Batteries; Some Notes on the Production of C.A.V.-Nife Cells. *Automobile Engineer,* v. 39, Mar. 1949, p. 114-117.
Design and fabrication methods and equipment. Manufacture of perforated steel strip used in plate construction by special punching equipment; assembly; and welding the all-steel containers.

21B-20. Manufacture of Auto Tire Chains. N. J. Gebert and A. M. Roberts. *Plating,* v. 36, Apr. 1949, p. 349-354.
The more important operations involved are: forming; link welding; twisting; bar welding; heat treating; polishing; plating; assembling; and inspection. (The plating step given greatest emphasis.)

21B-21. Stainless Steel Restaurant Equipment. *Sheet Metal Worker,* v. 40, Apr. 1949, p. 35-38.
Fabrication and assembly.

21B-22. The Manufacture of Hoes in Brazil. Joao Gustavo Haenel. *Steel Processing,* v. 35, Apr. 1949, p. 187-190.
Standard requirements and methods of manufacture. Heat treating, forming, and application of hard-metal cutting edges. Structure of bond between hard and soft metals is illustrated.

21B-23. Charts for Press-Fit Forces. I-III. Tyler G. Hicks. *American Machinist,* v. 93, May 5, 1949, p. 135, 137, 139.
Charts for steel shafts to steel hubs and to cast-iron hubs.

21B-24. Portsmouth Steel Corporation. *Wire and Wire Products,* v. 24, May 1949, p. 424, 445-446.
Modernized mill for all phases of steel manufacture, rolling and wire operations.

21B-25. Sheet Steel Processing at Carnegie's Gary Sheet & Tin Mill. *Better Enameling,* v. 20, May 1949, p. 8-12.

21B-26. (Book.) **Fabrication of Lukens Clad Steels.** Leonard W. Williams. 89 pages. 1948. Lukens Steel Co., 399 Lukens Building, Coatesville, Pa.
The various Lukens clad steels and their properties. Fabrication procedures used in their manufacture, including handling, heat treating, hot and cold working, shearing, bending, punching, rolling, machining, flame cutting, welding, finishing. Appendix gives tests and specifications.

21B-27. San Diego Firm Proves Versatile: From Ships to Shapes to Tractors. James Joseph. *Western Metals,* v. 7, May 1949, p. 22-23.
Equipment and procedures.

21B-28. All-Steel Fabricated Railway Coaches. *Engineer,* v. 187, May 6, 1949, p. 506-507.
Design and production of 60-ft. coach.

21B-29. Economies Produced by Welding Scrapped Locomotive Axles for Large Press Dies. *Iron Age,* v. 163, June 2, 1949, p. 125.

21B-30. Efficiency Is up in Cherry-Burrell's New Cedar Rapids Plant. *Production Engineering & Management,* v. 23, June 1949, p. 59-66.
Procedures and equipment for production of dairy equipment. Operations include machining, press operations, welding, plating, and finishing. 85% of the metal used is stainless steel.

21B-31. Weaving Stainless Steel Screening. *Iron Age,* v. 163, June 9, 1949, p. 68.
Production methods.

21B-32. Coil Springs From U. S. John Rauen, Jr. *Western Machinery and Steel World,* v. 40, May 1949, p. 84-85.
Fabrication of automotive suspension coil springs by the United States Spring & Bumper Co.

21B-33. The Heart of the Power Plant. Howard C. Forster. *Western Machinery and Steel World,* v. 40, May 1949, p. 88-89.
Fabrication of gears.

21B-34. A Million Parts Per Day. C. W. Hyden. *Western Machinery and Steel World,* v. 40, May, 1949, p. 100-101.
Fabrication development of Pacific Bolt Corp.

21B-35. Steering Linkage. *Western Machinery and Steel World,* v. 40, May 1949, p. 102.
Fabrication and assembly.

21B-36. The Manufacture of Coil Springs Under Completely Mechanized Conditions. *Wire and Wire Products,* v. 24, June 1949, p. 506, 527.
Operations include grinding, automatic handling, swaging, coiling, quench hardening, normalizing, shot peening, painting, and testing.

21B-37. Making Bearing Swivels Proves "Big Business". Thomas A. Dickinson. *Western Metals,* v. 7, June 1949, p. 34-35.
Procedures.

21B-38. One 100-lb. LP-Gas Cylinder a

Minute. Will C. Grant. *Industrial Gas,* v. 27, June 1949, p. 11-12, 24.
Fabrication of the above as well as 20-in. gas-line pipe. Application of gas furnaces in the process.

21B-39. How Link-Belt Produces Ball and Roller Bearings. D. I. Brown. *Iron Age,* v. 163, June 23, 1949, p. 74-80.
Manufacturing methods used, with particular emphasis on material used, heat treatment, tooling, coolants, grinding methods, and gaging.

21B-40. Production Use of Boron Steel. *Iron Age,* v. 163, June 23, 1949, p. 82. Condensed from paper by F. J. Robbins and J. J. Lawless.
Development of one particular boron-steel analysis and its evaluation on the basis of various production operations such as forging, hot forming, machining on automatic screw machines, and standard heat treatment encountered in volume-production operations. Standard hardenability, tensile, and impact tests.

21B-41. Plant Modernization Program Boosts Output of Ironers. *Production Engineering & Management,* v. 24, July 1949, p. 49-56.
Working, machining, welding, and finishing processes incorporated in ironer production.

21B-42. Pressure Vessels. A. C. Vivian. *Institute of Petroleum Review,* v. 3, June 1949, p. 161-166.
Methods of manufacture of steel vessels subjected to internal pressure in use in refinery equipment, vessels used in oilfields production, and high-pressure pipelines. Construction codes and test methods.

21B-43. Texlite Opens New Plant. *Better Enameling,* v. 20, July 1949, p. 8-15.
For manufacture of porcelain-enameled metal signs. Equipment and procedures.

21B-44. Freight Cars From California. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, July 1949, p. 68-71.
Basic steps in the fabrication of underframes for refrigerator cars. Riveting, welding, forming, and assembly are the principal operations.

21B-45. The Manufacture of Tubular Furniture. *Plating,* v. 36, Aug., 1949, p. 803-809.
Procedures.

21B-46. Building the Power-Actuated Cab for White's New 3000 Series Trucks. Joseph Geschelin. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 24-26.
Welding, assembly, and finishing operations.

21B-47. Precise Dimensional Control Necessary in Manufacture of Parts for Crown Cork. Gerald Eldridge Stedman. *Machine and Tool Blue Book,* v. 45, Aug. 1949, p. 65-68, 70-72, 74, 76, 78, 80.
Automatic and special machinery needed to hold volume production and close dimensional accuracy in the manufacture of crown corks. Rolling mills, vertical annealing ovens, presses, and conveyers combine to produce a highly integrated production flow. Plating and decorating procedures.

21B-48. Six Production Operations Eliminated. *Production Engineering & Management,* v. 24, Aug. 1949, p. 49.
Accomplished by substitution of stainless-steel tubing for sheet in fabrication of "gooseneck" parts for water coolers.

21B-49. Elimination of Manual Handling; The Story of Automation at Ford. *Production Engineering & Management,* v. 24, Aug. 1949, p. 51-52.
Automation is defined as the loading, processing in machine, unloading and transfer to the next operation without resorting to manual handling. Operations consist mainly of processing 4.5-in. O. D. by ⅛-in. wall tubing into rear-axle housings.

21B-50. Scale Ball Bearing Assemblies Require Delicate Processing and Handling. O. S. Carliss. *Steel,* v. 125, Aug. 1, 1949, p. 78-79.
Fabrication procedure. Bearings are not touched but are cleaned, lubricated, tested, and assembled in a completely dustless room on stainless-steel benches located in glass booths.

21B-51. Fracturing Connecting Rods to Assure Cap Alignment. *Automotive Industries,* v. 101, Aug. 15, 1949, p. 33.
Connecting rod designed for small engines is in the form of a one-piece forging with a round crankpin hole, machined and hardened before parting the cap. The unique feature is that the cap is fractured from the rod in a controlled manner and the two parts then fit together in perfect alignment without machining of the parting surfaces.

21B-52. Quarter-Mile Assembly Line for Truck Bodies. *Automotive Industries,* v. 101, Aug. 15, 1949, p. 34-35, 64.
Equipment and procedures (welding, press operations, and assembly).

21B-53. Closing the Bottle. *Plating,* v. 36, Sept. 1949, p. 922-927.
Bottle-cap manufacture. Major

operations are stamping, punching, shearing, coating, and plating.

21B-54. Automatic Methods for Auto Mass Production. *Production Engineering & Management,* v. 24, Sept. 1949, p. 53-60.

Miscellaneous procedures and equipment used in production of Buicks. Welding, forming, and machine-shop procedures are emphasized.

21B-55. Muncie's Iron Lung. D. I. Brown. *Iron Age,* v. 164, Sept. 22, 1949, p. 79-81.

Two 50-gal. drums welded together, a vacuum cleaner and an inventive metal-plant executive helped meet Muncie's polio emergency by improvising a workable iron lung in 10 hr. The welding, cutting, drilling, and fastening that went into making this iron lung.

21B-56. Canning Processes. Frank H. Slade. *Mechanical Handling,* v. 36, Sept. 1949, p. 540-547.

The various steps in production of tin cans, from the ore to the steel plate, the tinning operation, and fabrication of the cans.

21B-57. How To Control Dimensions in Liquid Nitrogen Shrink-Fitting. Gilbert P. Muir. *Tool Engineer,* v. 23, Sept. 1949, p. 21.

Some difficulty was encountered in obtaining proper fit between a compressor cylinder and a Ni-Resist liner. Tests indicate that optimum results are obtained when the centrifugally cast, rough-machined liners are pre-cold treated in liquid nitrogen, followed by machining to the desired o.d.

21B-58. How Ford Manufactures Stainless Headlamp Rims. Frank W. Gawrinski. *Iron Age,* v. 164, Sept. 29, 1949, p. 62-64.

Welding, flash trimming, forming, spinning, and polishing in a high-speed, mechanized series of operations.

21B-59. High Duty Applications of Acid-Resisting Silicon Iron. R. V. Riley. *Metallurgia,* v. 40, Aug. 1949, p. 185-188.

Manufacture of silicon-iron heater tubes designed to carry live steam at about 100 psi. while immersed in dilute sulfuric acid.

21B-60. Nickel-Clad Steel: Some Notes on Its Production, Fabrication and Applications. *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1894-1896.

Fabrication by welding, followed by rolling. A few applications.

21B-61. The Manufacture of Metal Containers; Some Aspects of Production Procedure. (Concluded.) *Sheet Metal Industries,* v. 26, Sept. 1949, p. 1903-1910.

Deals with manufacture of lids, joining the ends of the body, attachment of ends, labor problems and time study, factory layout, varnishing, soldering, making-up, testing soldered joints, flanging, seaming, testing, production of can ends, lubrication of presses and lining.

21B-62. Precision Cutters for Finished Lumber. Paul Graham. *Western Machinery and Steel World,* v. 40, Sept. 1949, p. 82-85.

Manufacture of the above at Henry Disston & Sons, Inc.

21B-63. Fabricating the Parts for the Hotpoint Range. B. E. Schroeder and M. E. Maurer. *Finish,* v. 6, Oct. 1949, p. H21-H26.

Procedures involved.

21B-64. Metals for High Duty. R. W. Bailey. *Engineering,* v. 168, Sept. 9, 1949, p. 265-266.

Some aspects of the development and use of metals which have characterized engineering progress.

21B-65. Forged Axles and Locomotive Forgings. American Iron and Steel Institute, Steel Products Manual, Sec. 22, July 1949, 43 pages.

Manufacturing practices and handling methods.

21B-66. Carbon Steel Structural Sections. American Iron and Steel Institute, Steel Products Manual, Sec. 4, Aug. 1949, 93 pages.

Manufacturing practices, quality requirements, chemical requirements, and handling methods. Includes standard practice tables, simplified practice recommendations, and standard specifications.

21B-67. Hot Rolled Carbon Steel Strip. American Iron and Steel Institute, Steel Products Manual, Sec. 12, Aug. 1949, 73 pages.

Metallurgical aspects, manufacturing practices, quality requirements, chemical requirements, and handling methods.

21B-68. Wrought Steel Wheels. American Iron and Steel Institute, Steel Products Manual, Sec. 20, Aug. 1949, 104 pages.

Manufacturing practices, handling methods, design data, wheel technology, and wheel specifications.

21B-69. Modern Refrigerator Production. J. Reers. *Sheet Metal Industries,* v. 26, Oct. 1949, p. 2155-2160.

This issue deals with factory equipment and layout, cabinet-shell production, material handling, and press operations on components. Forming and welding are emphasized. (To be continued.)

21B-70. (Book) **Steel Electrical Raceways.** 130 pages. 1949. Electrical Distribution Systems Committee, American Iron and Steel Institute, 350 Fifth Ave., New York. $1.00.

A reference source on rigid steel conduit and electrical metallic tubing for installers, inspectors, designers, and engineers. Contains basic dimensional data, NE code tables for conduit wiring installations, and practical suggestions for handling and installation of conduit materials.

21B-71. Production Problems of Turbojet Engines. T. S. McCrae. *SAE Quarterly Transactions,* v. 3, Oct. 1949, p. 582-591.

While these problems are no more complex than those encountered with reciprocating engines, they are of a different nature, since the major portion of the turbojet engine is welded sheet-metal structure. The so-called hot parts—combustion chamber, nozzle diaphragm, turbine, and tail cone—also present new problems. Problems associated with engine testing, fuel-control systems, etc.

21B-72. Steel and Electricity in Partnership. George L. Beaver. *Western Machinery and Steel World,* v. 40, Oct. 1949, p. 66-69, 96-97.

Steel-plate processing equipment, including electrical circuits, of Columbia Steel Co., Pittsburg, Calif. Includes pickling, cold rolling, shearing, annealing, tinning, galvanizing, etc.

21B-73. Seattle's Sawsmiths. Ralph G. Paul. *Western Machinery and Steel World,* v. 40, Oct. 1949, p. 70-73.

Production of circular and band saws.

21B-74. West Coast Firm Produces Complete Plants. Gilbert C. Close. *Modern Machine Shop,* v. 22, Nov. 1949, p. 100-106, 108, 110-111.

Miscellaneous fabrication equipment and procedures for construction of complete oil-refining and chemical-processing plants.

21B-75. Pop Corn Vendor Has a Variety of Exterior Finishes. Ezra A. Blount. *Products Finishing,* v. 14, Nov. 1949, p. 12-16, 18, 20, 22.

Manufacture of popcorn vendor bodies by forming and resistance welding, and their finishing by spray painting and infrared baking. Stainless-steel reinforcing rings and coin-insert plates are electropolished to mirror brightness.

21B-76. Production of Stainless Steel. Parts I–III. B. H. DeLong. *Steel,* v. 125, Oct. 31, 1949, p. 64, 66, 69-70, 72-73; Nov. 7, 1949, p. 132, 134, 137-138, 140; Nov. 14, 1949, p. 102, 104, 106, 109-110, 112, 115.

Part I: history of development; manufacture of stainless-steel ingots; melting and refining practice; forging and rolling; pickling; electropolishing; and wire drawing. Part II: types and causes of corrosion encountered in service. Steels are divided into three groups and data are tabulated. Part III: the various types of stainless steel, their physical properties, fabrication considerations, and indicated uses.

21B-77. Large Production Equipment Required for Caterpillar Steering-Clutch Cases. Arthur W. Johnson. *Machinery* (American), v. 56, Nov. 1949, p. 186-193.

In producing these housings, weighing about 800 lb. each, steel plates as thick as ⅝ in. are blanked, formed, and welded together, and the welded assemblies are machined to precision tolerances. Equipment and procedures.

21B-78. The Production of Vauxhall Cars; Methods Employed at the Luton Works of Vauxhall Motors Ltd. *Machinery* (London), v. 75, Oct. 27, 1949, p. 583-607.

Numerous machine-shop, presswork, and miscellaneous procedures and equipment as applied to specific operations.

21B-79. Fabrication of Apartment Size Ranges. Walter Rudolph. *Modern Industrial Press,* v. 11, Nov. 1949, p. 18, 22.

Press, machine-shop, riveting, buffing, and assembly operations.

21C—Nonferrous

21C-1. Spoons and Forks; Production Methods—Practical Plating Processes. F. R. Hill. *Metal Industry,* v. 73, Dec. 17, 1948, p. 486-488; Dec. 31, 1948, p. 526-528.

Practical details of the manufacture and plating of nickel-silver spoons and forks. Many so-called plating faults can be traced to defects in the base metal. First installment describes casting; rolling, stamping; pressing; and polishing. Second and concluding installment deals with specifications, equipment; anode materials and practice; solutions; plating procedures; filtration; bright plating; finishing; chromium plating; and speculum plating.

21C-2. Precious Metals in Los Angeles. Gordon B. Ashmead. *Western Machinery and Steel World,* v. 40, Mar. 1949, p. 82-85.

Facilities of Handy and Harman for preparation of bars, sheet, and

other forms for the jewelry manufacturer. Scrap recovery procedures; melting, refining, rolling, drawing, and annealing.

21C-3. Rolled Metals, Tubes and Sections. *Metal Industry,* v. 74, June 17, 1949, p. 479-482.

Brass and copper casting, extrusion, and piercing, tube drawing, cold rolling, metal cleaning, and precision rolling.

21C-4. Sheet and Strip Production. *Metal Industry,* v. 75, July 8, 1949, p. 23-26; July 15, 1949, p. 48-49.

Rolling mills, foundry, annealing, pickling and cleaning, shearing, inspection, machining, and handling at British plant. Production consists of a variety of nonferrous metals and alloys.

21C-5. Making Money; How U. S. Mints Operate in Producing Coinage. Leland Howard. *Mining Congress Journal,* v. 35, Aug. 1949, p. 36-40, 61.

Equipment and procedures, including molding, rolling, stamping, surface finishing, upsetting, etc.

21C-6. Condenser Tube Manufacture: The Allen Everitt Works of I.C.I. Ltd. (Metals Division). *Metal Industry,* v. 75, Aug. 19, 1949, p. 143-147.

British plant devoted to the manufacture of Cu-base alloy tubes. Casting, extrusion, tube drawing and reduction, annealing, heat treatment, and inspection are dealt with.

21C-7. A Dive Into Duck Season. Pat Jarman. *Steelways,* v. 5, Sept. 1949, p. 18-19.

Manufacture of lead shot in the shot tower. Finishing operations.

21C-8. Fabrication of Copper-Base Alloys. *Metal Industry,* v. 75, Oct. 14, 1949, p. 314-316.

Equipment and procedures of Dives Works of Compagnie Générale du Duralumin et du Cuivre in France.

21C-9. Gone Are the Days of the Old Wash Boiler. *Inco,* v. 23, Fall 1949, p. 16-19.

Materials, equipment, and procedures for production of hot-water heaters. Test procedures and Ni alloys used.

21C-10. Continuous Casting Teamed With Cold Rolling Affords Improved Product Quality and Economy of Operation. *Steel,* v. 125, Dec. 19, 1949, p. 74-77, 106.

New production line of Scovill Mfg. Co. which organizes, in one straight flow, all the equipment necessary for producing cold-rolled brass, from flat-metal casting to packaging of the finished strip and sheet. Operational sequence begins with electric induction-heating units followed by continuous casting; bar corner milling; two-high roughing; annealing; bar-surface milling; four-high rundown; annealing, pickling, and cleaning; four-high finishing; further annealing; pickling and cleaning; inspection, slitting, and packaging.

21D—Light Metals

21D-1. Tensioning Skin-Panels. *Aircraft Production,* v. 11, Jan. 1949, p. 9-11.

Describes and illustrates mechanical and thermal methods used by a British firm for applying tension to thin sheets of metal used in production of the smaller aircraft surfaces. Application of tension during riveting serves to eliminate defective pieces, since they fail under this tension instead of possibly later on in service.

21D-2. Report on the Bristol Brabazon. *Aircraft Production,* v. 11, Jan. 1949, p. 20-28.

Structure of the outer wing; spar manufacture; outer-wing assembly.

21D-3. Prime-Coated for Prime Quality. *Bakelite Review,* v. 20, Jan. 1949, p. 20-22.

Production and installation of Kaiser aluminum siding prime coated with a Vinylite resin-base coating.

21D-4. Contract Fabricating at Reynolds. *Modern Metals,* v. 5, Feb. 1949, p. 13-17.

A typical operation: fabricating of aluminum washing-machine tubs.

21D-5. Aluminum Bus Manufacturing. Walter Rudolph. *Light Metal Age,* v. 7, Apr. 1949, p. 8-9, 16.

21D-6. The Nord Norécrin. James Hay Stevens. *Aircraft Engineering,* v. 21, Apr. 1949, p. 117-121.

Manufacturing methods for French lightweight airplane.

21D-7. Hermes IV and Hastings. Part III. Front and Rear Fuselage-Sections; Trolley- and Skin-Covering Fixture Stages; Centre Fuselage; Wing. S. C. Poulsen. *Aircraft Production,* v. 11, May 1949, p. 149-156.

Production of above components of British planes. (To be concluded.)

21D-8. Manufacturing and Physicals of Aluminum Go Hand-in-Hand. *SAE Journal,* v. 57, June 1949, p. 62-64. Based on "The Design of Aircraft Structure for 'Mass Production'" by O. A. Wheelon, to be printed in full in *SAE Quarterly Transactions.*

Current aircraft design trends

and their influence on physical properties.

21D-9. Manufacturing Three-Dimensional Aluminum Letters. *Light Metal Age,* v. 7, June 1949, p. 16-17.

Fabrication processes. Letters are said to be sturdy, attractive, and economical.

21D-10. Canadair Production; An Outline of the Plant and Manufacturing Organization. *Aircraft Production,* v. 11, July 1949, p. 229-233.

With emphasis on forming operations.

21D-11. The Brabazon Prototype: A Survey of Some of the Fabrication and Assembly Methods in Use on the World's Largest Aircraft. (Continued.) A. W. Morgan. *Sheet Metal Industries,* v. 26, July 1949, p. 1473-1480, 1488; Aug. 1949, p. 1669-1677.

July installment: riveting procedures; heat treatment of rivets; the rear-body assembly; technology of the materials used (mainly the Al alloy DTD 364); and forming, machining, and welding of fuselage stringers. Aug. installment: manufacture and assembly of frame cleats and formers. (To be continued.)

21D-12. Ship-Building and Light Alloy. (Concluded.) *Light Metals,* v. 12, Aug. 1949, p. 439-449.

Summary of papers presented at recent symposium of Aluminum Development Association. Miscellaneous fabrication procedures and applications.

21D-13. Unit Scaffolds of Aluminum. *Western Machinery and Steel World,* v. 40, Aug. 1949, p. 73-75.

Fabrication methods.

21D-14. The Production of Light Alloy Forgings and Stampings; Methods Employed at the Redditch Works of High Duty Alloys, Ltd. *Machinery* (London), v. 75, Sept. 1, 1949, p. 295-300.

Casting, forming, and machine-shop procedures and equipment.

21D-15. Rolled Aluminum From Bauxite to Finished Sheet. Marcia Lee. *United Effort,* v. 29, July-Aug. 1949, p. 5-9.

Fabrication of the above in various plants of the Permanente Products Co.

21D-16. The Brabazon Prototype: A Survey of Some of the Fabrication and Assembly Methods in Use on the World's Largest Aircraft. (Continued.) A. W. Morgan. *Sheet Metal Industries,* v. 26, Oct. 1949, p. 2161-2166.

Production of the internal-wing structure. (To be continued.)

21D-17. Short Runs and Specialized Production at Brown Trailers, Inc., Spokane, Wash. Howard E. Jackson. *Modern Industrial Press,* v. 11, Oct. 1949, p. 16, 18, 22.

Procedures and equipment in production of custom-built Al truck trailers. Press, machining, heat treating, foundry, and inspection procedures.

21D-18. (Book) **Aluminum and Magnesium Design and Fabrication. R. Burt Schulze. 589 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. $7.50.**

Processing, manufacturing methods, and costs. Machining, welded and bonded fastenings, and finishing.

SECTION XXII

JOINING and FLAME CUTTING

22A—General

22A-1. Soldering the White Metals. *Sheet Metal Worker,* v. 39, Dec. 1948, p. 41-43.

Recommended procedures for stainless, monel, and aluminum.

22A-2. Welding Comes of Age Through Standards. Simon A. Greenberg. *Standards World,* v. 1, Winter 1948, p. 37-49.

22A-3. New Life for Spotwelding Electrodes. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 92.

New device for resurfacing spotweld electrode tips.

22A-4. Something New in Welding. *Western Machinery and Steel World,* v. 39, Dec. 1948, p. 94-95.

The "Aircomatic" process, a gas-shielded metal-arc method for welding Al and Al alloys in which a wire-form electrode is fed through a manually operated gun. Application to other metals is being investigated.

22A-5. Interaction of Elements and Their Oxides in the Welding Bath During Welding of Metals. (In Russian.) N. N. Dobrakhotov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 14-19.

The physicochemical bases of the regulation of the composition of the gas flame and the interaction of elements and their oxides during gas welding of metals. A series of formulas is proposed for calculation of such reactions. 5 ref.

22A-6. Dummy Loads for Large Industrial Welders. A. W. Brown and S. E. Johnson. *Electrical Engineering,* v. 68, Jan. 1949, p. 12-14.

A solution to the problem of objectionable voltage fluctuation in large industrial welders can be brought about by electronically interlocking each single-phase welder with a dummy load to fill in the period of no load between welds. This method also results in considerable reduction in power consumption of the ballast load.

22A-7. Characteristics of the Arc in "Heliarc" Welding. H. T. Herbst. *Electrical Engineering,* v. 68, Jan. 1949, p. 30-33.

Two distinctly different properties of an electric arc in an atmosphere of inert gas are—a cleaning action of the arc when d.c. reverse polarity is used on oxide-forming metals, and the resistance to current flow which is considerably higher when the electrode is positive. Effect on application of the Heliarc welding process.

22A-8. Idle Welders Needn't Cost Money. F. H. Varney. *Welding Engineer,* v. 34, Jan. 1949, p. 52-55.

Possibilities for saving power and cutting d.c. welding costs by means of the automatic start-stop control and arc-time totalizer.

22A-9. Spot Welding with Inert Gas. Frank J. Pilia. *Welding Engineer,* v. 34, Jan. 1949, p. 56-58, 60.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-10. Soldering Fluxes. *Iron Age,* v. 162, Dec. 30, 1948, p. 33. Based on "Notes on Soldering," a publication of Tin Research Institute, England.

Some of the more common fluxes for soldering and their characteristics.

22A-11. Zur Entwicklung von Elektrodenwerkstoffen fur die elektrische Widerstandsschweibung. (The Development of Electrode Materials for Electrical Resistance Welding.) H. J. Seemann and M. Dadek. *Metall,* May 1948, p. 146-150.

Experimental data on various copper-alloy electrodes containing small additions of Mg, Sb, Ca, and V. The effect of annealing temperature on hardness and conductivity. 30 ref.

22A-12. How to Set up an Arc Welding Department. W. R. Pearsons. *Machine*

and Tool Blue Book, v. 45, Jan. 1949, p. 109-116, 118, 120, 122, 124-128, 130.

Space required, equipment, and accessories needed. Selection of joints and electrodes, as well as production control.

22A-13. Here's How Welding Research and Development Pay Off at Ford Motor Co. *Industry and Welding,* v. 22, Jan. 1949, p. 26-31, 61, 63-64.

22A-14. Production Processes—Their Influence on Design. Part XL. Projection Welding. Roger W. Bolz. *Machine Design,* v. 21, Jan. 1949, p. 121-126.

Various types of projection-welding machines and their applications; recommended typical design components.

22A-15. Research and Development in the U. S. A. and Canada. H. G. Taylor. *Welding,* v. 16, Dec. 1948, p. 504-510.

A British visitor gives his impressions of some of the most important developments in welding science.

22A-16. Current Trends in Good Brazing Practice. Ralph Melaney, J. H. Doak, and Stanton T. Olinger. *Steel,* v. 124, Jan. 10, 1949, p. 56-59, 90-91.

Processes for joining similar and dissimilar metals with Cu, Cu alloys, and Ag alloys with emphasis on alloys, methods of application, preparation of joints, heating practice, flux removal, and cleaning.

22A-17. Gas-Shielded Metal-Arc Welding With Continuous Filler Metal Feed. Jesse S. Sohn and A. N. Kugler. *Machinery* (American), v. 55, Jan. 1949, p. 176-179. A condensation.

Previously listed from *Welding Journal.* (See item 22a-244, 1948.)

22A-18. What Not to Do When Resistance Welding. R. T. Gillette. *American Machinist,* v. 93, Jan. 13, 1949, p. 85-89.

Typical poor practices and companion recommended methods.

22A-19. Inert Gas-Shielded-Arc Spot Welding. F. J. Pilia. *Welding Journal,* v. 28, Jan. 1949, p. 5-11.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-20. Adams Lecture: The Metallurgy of Covered Electrode Weld Metal. G. E. Claussen. *Welding Journal,* v. 28, Jan. 1949, p. 12-24.

Further advances in arc welding can be made on the basis of comprehensive studies of slags, their functions, and control.

22A-21. Welding in Steel Mill Maintenance. L. P. Elly. *Welding Journal,* v. 28, Jan. 1949, p. 38-45.

22A-22. Hard Facing With Inert-Gas-Arc Welding. K. H. Koopman. *Welding Journal,* v. 28, Jan. 1949, p. 46-52.

An investigation of inert-gas-shielded-arc welding procedures for hard facing mild steel, copper and Cu-base alloys, and stainless steel. The surfacing of mild and stainless steels with metals other than hard-facing alloys.

22A-23. Designing for Welding. Part 1. Wallace A. Stanley. *Welding Journal,* v. 28, Jan. 1949, p. 63-64.

Diagrams and text are intended to familiarize the designer with some of the basic principles called for by the various methods of resistance welding. Essentials of spot, projection, and seam welding. (To be continued.)

22A-24. Residual Stresses Due to Welding. R. Weck. *Welding Journal,* v. 28, Jan. 1949, p. 9s-14s.

Plastic deformations and residual stresses occurring in mild steel plates joined by a butt weld were measured with the Tomlinson strain gage in the immediate vicinity of the weld. The stresses were found to be near the yield point, and it is believed that stresses of this magnitude will always be found in welded steel. Welding procedure was of little influence on the magnitude of the stresses. Restriction of angular distortion produced the highest stresses. Brittle failures which are sometimes ascribed to residual stresses appear to be due to faulty design and unsuitable material.

22A-25 (Book). **Gas Welding and Cutting: A Practical Guide to the Best Techniques.** C. G. Bainbridge. 305 pages. 1948. Published by Louis Cassier Co., Ltd. (Distributor: Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E.1, England.) 15s. (postage, 6d.)

A textbook for the practical welder. Does not review applications, except for illustrative purposes.

22A-26. (Book). **Design for Welding.** R. S. Green, editor. Over 1000 pages. 1948. James F. Lincoln Arc Welding Foundation, Cleveland 1, Ohio. $2.00 in U. S. $2.50 elsewhere.

Composed of abstracts of 82 award papers from the recent Foundation "Design-for-Progress" Award Program. Includes cost data on the various designs. Papers are classed in the following categories: aircraft, automotive, railroad, watercraft, containers, furniture, structure, machinery, and welderies.

22A-27 (Book). **Notes on Soldering.** W. R. Lewis. 88 pagees. 1948. Tin Research Institute, Fraser Rd., Green-

ford, Middlesex, England. Free, on request. (Readers in U. S. may apply to Bruce Gonser, Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio.)

The title "Notes" hardly fits a 90-page book describing a metallurgical operation performed with indifferent success by millions of amateurs. As a matter of fact, soft soldering with tin-base alloys is used in a surprising number of engineering applications, some highly mechanized. For example, the manufacture of tin cans—a hand operation in grandpa's day. Consequently much study has been given to all details of the process, and the known facts are well summarized in this publication. (E.E.T.)

22A-28. **Heliarc Welding Shows Notable Versatility.** Thomas A. Dickinson. *Western Metals,* v. 7, Jan. 1949, p. 30-31.

Various applications.

22A-29. **Selection of Equipment for Three-Phase Arc Welding.** (In Russian). N. S. Siunov. *Avtogennoe Delo* (Welding), Oct. 1948, p. 1-6.

Various types of equipment. Particularly high operating efficiency was shown by automatic welding with the 3-phase arc under flux.

22A-30. **Method of Determination of Basic Mechanisms of the Electrode-Melting Process During Arc Welding.** (In Russian.) A. A. Erokhin. *Avtogennoe Delo* (Welding), Oct. 1948, p. 6-11.

Determination of coefficient of loss, rate of electrode melting, coefficients of "weight of coating" (ratio between amount of coating and electrode metal melted), and coefficient of slag yield. Formulas for calculation.

22A-31. **Automatic Argon-Arc Welding of Thin Sheet Metals.** (In Russian.) A. Ya. Brodskii. *Avtogennoe Delo* (Welding), Oct. 1948, p. 11-17.

Method and equipment. Sphere of application and optimum conditions of operation.

22A-32. **Control of Warping of Thin Sheets During Arc Butt Welding.** (In Russian.) N. N. Prokhorov. *Avtogennoe Delo* (Welding), Oct. 1948, p. 17-20.

Causes of warping. Methods of decreasing or completely eliminating it.

22A-33. **Gummi-Metall-Bindung mit Hilfe von Vermessingung.** (Rubber-Metal Joining by Means of Brass Plating.) G. E. Proske. *Metalloberfläche,* v. 2, April 1948, p. 79-83.

The method is based on the observation that normal soft rubber, when vulcanized on metal, does not adhere to iron but does adhere to brass. For this purpose, however, the brass plating must be done by a special method.

22A-34. **A Survey of Established Processes for the Jointing of Metals.** (Concluded.) D. F. Hewitt. *Sheet Metal Industries,* v. 25, July 1948, p. 1399-1400; Sept. 1948, p. 1813-1821.

July: plastic bonding; Sept.: riveting; joint design.

22A-35. **Two Methods of Estimating the Weldability of Metals by Resistance Measurement.** W. S. Simmie. *Sheet Metal Industries,* v. 25, July 1948, p. 1407-1409.

Methods and equipment for low and high-pressure resistance measurement as an aid in estimation of weldability.

22A-36. **The Application of Resistance Welding to Sheet Metal Practice.** L. H. Park. *Sheet Metal Industries,* v. 25, Dec. 1948, p. 2487-2494, 2496, 2498.

Seam welding; resistance weld overlaps; electrode pick-ups; welding fits; weld distortion; projection welding; electric heading or riveting; resistance soldering and brazing; soldering and brazing alloys and fluxes.

22A-37. **Some Fundamental Principles of Argon Arc-Welding.** *Sheet Metal Industries,* v. 26, Jan. 1949, p. 169-170, 174.

22A-38. **Here's How Welding Research and Development Pay Off at International Harvester.** C. D. Evans. *Industry and Welding,* v. 22, Feb. 1949, p. 26-29, 46, 48, 50.

Equipment, procedures, and research programs.

22A-39. **Analyzing the Cause of Failures in Weldments.** Gerald von Stroh. *Machine and Tool Blue Book,* v. 45, Feb. 1949, p. 135-140, 142, 144, 146-150, 152, 154-155.

An analysis of various failures, their causes, cures, as well as fundamental design facts.

22A-40. **Practical Aspects of Inert-Gas Welding.** H. A. Huff, Jr., and A. N. Kugler. *Welding Journal,* v. 28, Feb. 1949, p. 128-140.

Description of the process; gases used; electrodes; straight vs. reversed polarity, d.c. and a.c. welding equipment; control of gas flow; and techniques in welding stainless steel, aluminum, copper, magnesium, steel, and other metals.

22A-41. **New Approach to Single Phase Welding.** Ivar W. Johnson. *Steel,* v. 124, Feb. 14, 1949, p. 93-94.

The possibility of greatly improving the spot welding of aluminum and its alloys in particular, and of enhancing resistance welding in general, is demonstrated by an investigation of the effect of varying the current envelope of a standard 60-cycle spot welder.

22A-42. That Problem of Radio Interference. *Welding Engineer,* v. 34, Feb. 1949, p. 33-37, 48. Based on "Recommended Practices for the Installation of High-Frequency Stabilized Arc Welding Equipment," prepared by R. R. Lobosco for National Electrical Manufacturers Association.

How to avoid radio interference with high-frequency stabilized installations for inert-gas arc welding.

22A-43. What Welding Means to America. Part One: Primary Metals Industries. T. B. Jefferson. *Welding Engineer,* v. 34, Feb. 1949, p. 38-39, 64.

Results of survey.

22A-44. Production Processes—Their Influence on Design. Part XLI. Butt Welding. Roger W. Bolz. *Machine Design,* v. 21, Feb. 1949, p. 103-110.

Various methods and equipment; design recommendations.

22A-45. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part I. R. Weck. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 91-96.

Starting from first principles, this series of articles will present available information on fatigue failure in simple language and in a form most useful to the welding engineer. (To be continued.)

22A-46. Some Aspects of Welding Research in Great Britain and America. Part I. H. G. Taylor. *Transactions of the Institute of Welding,* v. 11, Dec. 1948, p. 206-211.

Work of the British Welding Research Association. (To be concluded.)

22A-47. Cyclic Heating Test of Main Steam Piping Joints Between Ferritic & Austenitic Steels, Sewaren Generating Station. H. Weisberg. *American Society of Mechanical Engineers,* Paper No. 48-A-87, 1948, 15 pages.

Describes tests. Tables summarize data on the weld joining of full-size, heavy-wall pipe joints.

22A-48. Survey of Automatic Arc and Gas Welding Processes as Used in the Automotive Industry. *Automotive Welding Committee, American Welding Society* (New York), 1948, 17 pages.

Basic principles and general limitations affecting each process. Data apply primarily to the welding of butt joints.

22A-49. (Book). **Practical Arc Welding.** 516 pages. 1948. Hobart Brothers, Box EW-82, Troy, Ohio. $2.00

Arc welding and its applications. Illustrations of actual welding jobs, tables and charts of useful data are included.

22A-50. The Welding, Brazing and Soldering of Coated Metals. E. V. Beatson. *Journal of the Electrodepositors' Technical Society,* v. 24, 1949, p. 41-56. (Preprint.)

General characteristics of the various processes in the order of ascending joining temperatures. 13 ref.

22A-51. Factors That Affect Welding Costs. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 36-38, 48.

Fit-up and joint design; position; jigs and fixtures; electrodes; and welding techniques for medium gages of sheet metal.

22A-52. Comparable Arcwelding Electrodes. *Iron Age,* v. 163, Feb. 24, 1949, p. 85-96.

Tables give trade names of comparable electrodes, welding position, electrode coating used, and ASTM-AWS specification numbers. Separate tables cover mild-steel, low-alloy steel, corrosion resistant steel, stainless steel and copper arc-welding electrodes.

22A-53. Progress in Arc Welding. C. P. Croco. *Westinghouse Engineer,* v. 9, Mar. 1949, p. 34-39.

Methods and equipment. History of development.

22A-54. Power Analysis of A-C Welders. F. B. Mead. *Westinghouse Engineer,* v. 9, Mar. 1949, p. 40-41.

How to estimate power requirements by simple vector analysis of loads for both a.c. and d.c. welding machines.

22A-55. Mechanical Properties of Adhesive Bonds. *Product Engineering,* v. 20, Mar. 1949, p. 150-152. Condensed from "Shear Impact and Shear Tensile Properties of Adhesives" by Irving Silver.

Results of experimental study of bonded joints under shear-impact and shear-tensile loading. Limited to room-temperature-setting adhesives. The materials adhered were pulp-filled phenolics and commercial brass

22A-56. Superior Welding and Brazing. *Industry and Welding,* v. 22, Mar. 1949, p. 32-34, 63-64, 66-69.

Procedures and equipment of repair welding shop.

22A-57. Tungsten: To Save or Not to Save. R. W. Tuthill. *Welding Engineer,* v. 34, Mar. 1949, p. 42-45.

The problem of whether or not to protect the tungsten electrode against oxidation by means of argon. Relative costs of tungsten and argon; effects of consumed tungsten on weld properties; means of reducing tungsten composition other than by argon shielding.

22A-58. Rod Template for Stack Cutting. Phil Glanzer. *Welding Engineer,* v. 34, Mar. 1949, p. 51.

Shop-made grooved driving wheel enables the tracing unit of a portable shape-cutting machine to run on a "track" template made by bending welding rods and tacking them to a heavy base plate.

22A-59. Effectiveness of the Metal-Fusion Process During Arc Welding. (In Russian.) N. N. Rykalin. *Doklady Akademii Nauk SSSR* (Reports of the Academy of Sciences of the USSR), new ser., v. 63, Nov. 11, 1948, p. 131-134.

Proposes formulas. Influence of factors involved. Theoretical data compared with results of experiment, showing quite close correlation.

22A-60. The Electronic Measurement and Control of Heat. Part 3. Electronics and Welding. John H. Jupe. *Electronic Engineering,* v. 21, Mar. 1949, p. 94-97.

Includes numerous circuit diagrams.

22A-61. Poke Welding Offers New Method of Joining Stainless, Aluminum and Mild Steel. F. J. Pilia. *Materials & Methods,* v. 29, Mar. 1949, p. 64-67.

See abstract from *Industry and Welding,* item 22a-258, 1948.

22A-62. Arc and Resistance Welding Developments. E. F. Potter. *Tool Engineer,* v. 22, Mar. 1949, p. 29-30.

1948 developments.

22A-63. Inert-Gas-Shielded Arc Welding Equipment. N. E. Anderson. *Welding Journal,* v. 28, Mar. 1949, p. 222-228.

Evolutionary design changes in the various parts of equipment for modern shielded-arc welding.

22A-64. The Definition of Welding Positions. E. Flintham. *Welding Journal,* v. 28, Mar. 1949, p. 229-234.

How and why the proposals made by the British Joint Committee differ from the American and Australian proposals.

22A-65. Controlling Cutting Tip Clearance. H. G. Hughey and R. B. Steele. *Welding Journal,* v. 28, Mar. 1949, p. 239-242.

Need for equipment which will follow irregular rather than flat surfaces, operate at high speeds, and be unaffected by high temperatures. New equipment provides either mechanical or "flammatic" control. The latter type uses for a spacing device a flame of conventional type which "feels" the work surface. Any rise or fall of the surface is detected by this feeler, which sends a message to an electronic control system that accurately positions the torch.

22A-66. Resistance Welding Developments. F. L. Brandt. *Welding Journal,* v. 28, Mar. 1949, p. 254-257.

The synchromatic flash welder and three-phase power-converter-controlled spot, projection, and seam welders. Fundamental principles leading to these developments.

22A-67. Production Tooling for Automatic Welding. Cecil C. Peck. *Welding Journal,* v. 28, Mar. 1949, p. 257-259.

Various types of automatic production welding machines, their advantages, and qualifications of the designer of automatic machines.

22A-68. How to Design Brackets. *Welding Journal,* v. 28, Mar. 1949, p. 260-261.

Miscellaneous welded-bracket designs.

22A-69. Designing for Welding. Part III. Wallace A. Stanley. *Welding Journal,* v. 28, Mar. 1949, p. 262-263.

Elementary principles of design for spot welding. (To be continued.)

22A-70. Robbery in the Welding Shop. R. L. Townsend. *Welding Journal,* v. 28, Mar. 1949, p. 264-265.

Power losses due to loose cable connections and small inefficient cable sizes. Discomfort caused by poor electrode holders.

22A-71. What Welding Means to America. Part Two. Fabricated Metals Industries. T. B. Jefferson. *Welding Engineer,* v. 34, Mar. 1949, p. 48-50.

Results of a survey. (To be continued.)

22A-72. Arc Welding Data Charts for Drawing Office and Workshop. R. J. Fowler. *Welding,* v. 17, Feb. 1949, p. 67-71.

The value of charts for the standardization of methods of indicating weld design and weld procedure as regards work on mild steel. Charts can also be used in connection with the estimation of electrode quantities for different types of welds. (To be continued.)

22A-73. Heat Efficiency of Melting of Base-Metal During Arc Welding. (In Russian.) N. N. Rykalin. *Avtogennoe Delo* (Welding), Nov. 1948, p. 1-7.

Expanded version of article in *Doklady Akademii Nauk SSSR*. See item 22A-59, 1949.

22A-74. Determination of Pressure on Electrodes in Contact Welding Machines by Measurement of the Deformation of the Arm of the Machine. (In Russian.) A. Z. Blitshtein. *Avtogennoe Delo* (Welding), Nov. 1948, p. 13-14.

A new method, consisting of measuring by a micrometric device, the deformation of the arm supporting one of the electrodes during automatic welding.

22A-75. The Alloying of the Deposited Metal During Arc Welding. (In Russian.) P. S. Elistratov. *Avtogennoe Delo* (Welding), Nov. 1948, p. 18-19.

Chemical changes resulting from the different composition of the base metal, the electrode, and the electrode coating. All three of these factors should be taken into consideration for prediction of the composition of the weld metal and its characteristics.

22A-76. Industrial Process for Manufacture of a Copper-Chromium Alloy for Electrodes of Contact-Welding Machines. (In Russian.) I. M. Goryachev and E. A. Smirnova. *Avtogennoe Delo* (Welding), Nov. 1948, p. 20-21.

The influence of different electrode-alloy elements; optimum core and coating compositions; method of production; physicochemical properties of coated electrodes.

22A-77. (Book.) **Welding Fundamentals.** H. P. Rigsby. 178 pages. 1948. Pitman Publishing Corp., 2 West 45th St., New York 19. $2.75.

In this compilation of the fundamentals and principles of welding for the engineering student, the actual technique of welding is treated as secondary material. Historical development of the various welding methods and equipment needed for each. Welding gases, rods, fluxes, and types of joints, as well as the testing of welds. Standard welding symbols and a glossary of welding terms.

22A-78. Stud Welding Gun. *Plastics* (London), v. 13, Mar. 1949, p. 120-121.

Gun uses plastic housing which has proven satisfactory in service.

22A-79. Arc Welding Data Charts for Drawing Office and Workshop. (Continued.) R. J. Fowler. *Welding*, v. 17, Mar. 1949, p. 117-121, 129.

Standard work charts. Chart for estimation of electrode quantities.

22A-80. Tooling for Welding; Notes on Jig and Fixture Design. S. J. Pugh. *Welding*, v. 17, Mar. 1949, p. 122-125.

Some recommendations for designing jigs and fixtures suitable for high-speed projection welding. Practical examples.

22A-81. High-Speed Recording of Arc Welding Phenomena. L. H. Orton and J. C. Needham. *Welding*, v. 17, Mar. 1949, p. 126-127.

Use of oscillographic equipment.

22A-82. Bonding of Steel to Cast Aluminum and Uses Thereof. C. E. Stevens, Jr. *Metal Progress*, v. 55, Mar. 1949, p. 326-331.

A steel cylinder liner chemically bonded to aluminum exterior fins was found to have vastly better heat transfer than the conventional finned-steel construction. Bimetallic casting techniques and properties of the joint. The Al-Fin process has been extended successfully to the manufacture of brake drums and power-tube radiators, to aluminum gearing with steel hubs, and to steel-backed bearings. Mechanical test procedure.

22A-83. Rubber Bonding. Part 1. W. J. S. Naunton and J. M. Buist. *India Rubber Journal*, v. 116, Mar. 19, 1949, p. 15-16. A condensation.

Experiments made with three types of organic bonding agents and different types of metals.

22A-84. Miniature Spot Welding Electrodes. *Machinery Lloyd* (Overseas Edition), v. 21, Mar. 12, 1949, p. 81-82.

Electrodes and their fixtures as designed for welding of small components used in electron tubes.

22A-85. Techniques for Spot Welding. Frederick S. Dever. *Welding Engineer*, v. 34, Apr. 1949, p. 46-51.

Recommendations for designer and welder. Applications. Spot-weld charts developed to facilitate setups. Inspection procedures.

22A-86. What Welding Means to America. Part Three: Machinery—Electrical and Non-Electrical. T. B. Jefferson. *Welding Engineer*, v. 34, Apr. 1949, p. 54-56.

Results of a survey showing application of different types of welding in different plants.

22A-87. Big Welders in Czechoslovakia. Beth Fisher. *Welding Engineer*, v. 34, Apr. 1949, p. 62, 64.

Large flash welder and large spot welder made in Czechoslovakia.

22A-88. A Survey of Modern Theory on Welding and Weldability. D. Séférian. *Sheet Metal Industries*, v. 26, Mar. 1949, p. 597-604; Apr. 1949, p. 827-835.

Begins series which will examine present-day technique and application in the light of modern theory and control methods. March: The fundamentals of various types of

welding flames. April: the technique of oxy-acetylene welding and distinguishing characteristics of the different oxy-acetylene methods. (To be continued.)

22A-89. New Self-Heating Tape Simplifies Soldering Operations. Robert B. Stanton. *Materials & Methods,* v. 29, Apr. 1949, p. 57.

Tape consists of a ribbon of lead-tin solder attached to a ribbon of vinyl plastic, in which aluminum-type heating fuels are dispersed. It has been used successfully to assemble Cu, brass, Sn, Al, Fe, Zn, and related types of alloy wires and fabricated sheet stock in thicknesses up to approximately 0.2 in.

22A-90. Salt-Bath Brazing. *Metallurgia,* v. 39, Mar. 1949, p. 257-259.

Some of the advantages of the method; information obtained as a result of development work.

22A-91. Comparative Strengths of Some Adhesive-Adherend Systems. N. J. DeLollis, Nancy Rucker, and J. E. Wier. *National Advisory Committee for Aeronautics,* Technical Note No. 1863, Mar. 1949, 43 pages.

Adhesives evaluated were polyvinyl acetate, cellulose nitrate, resorcinol resin, casein, gum arabic, natural rubber, and neoprene. "Adherends" were stainless steel, Al alloy, paper-phenolic laminate, glass, birch wood, and hard rubber. The properties studied were double-lap shear, tensile, long-time loading shear, and impact strengths.

22A-92. Le collage du caoutchouc aux métaux a l'aide de nouveaux dérivés chimiques du caoutchouc. (Bonding Rubber to Metals by Means of New Chemical Derivatives of Rubber.) Jacques Gossot. *Revue Générale du Caoutchouc,* v. 26, Apr. 1949, p. 273-278.

In attempting to find a non-thermo-plastic bonding agent, various rubber derivatives were studied. The acrylonitrile derivative gave the most encouraging results. General process for bonding rubber to metal was developed.

22A-93. Neue Erkenntnisse uber die Vorgänge im Schweisslichtbogen von Mantelelektroden. (New Facts on Electric-Arc Reactions of Coated Welding Electrodes.) W. Hummitzsch. *Schweisstechnik,* v. 2, May 1948, p. 50-54; June 1948, p. 67-70; July 1948, p. 84-89.

Results of recent research, including composition of the arc atmosphere, theory of ionization, and movement and neutralization of ions. The nature and behavior of a.c. and d.c. arcs in welding. It is shown that the melting efficiency of coated electrodes is proportional to the ionization energy of the coating substances. 10 ref.

22A-94. (Book.) **The Properties of Soft Solders and Soldered Joints.** J. McKeown. 118 pages. 1948. British Non-Ferrous Metals Research Association, Euston Street, London, N.W. 1, England. $4.00 (17s, 6d).

Investigations and results obtained in a war-time research to increase knowledge of the properties of solders having lower tin contents.

22A-95. Rivet Flexibility and Load Diffusion. E. H. Mansfield. *Aircraft Engineering,* v. 21, Apr. 1949, p. 96-98, 116.

Mathematical analysis shows how strength and stiffness of rivets affect structure. Relative efficiency of rivets and spot welds. Three cases are worked out.

22A-96. All-Weld-Metal Tensile Tests; Elimination of Variables for Quality Control. E. Flintham. *Welding,* v. 17, Apr. 1949, p. 160-164.

The author feels that tests required by British Standards are not satisfactory for quality control. Suggests new procedures which would eliminate variables as far as possible.

22A-97. Railroad Car Welding. C. R. Strutz. *Welding Journal,* v. 28, Apr. 1949, p. 329-334.

Applications of submerged-melt and inert-gas welding to stainless steel and nonferrous-metal welding.

22A-98. Open-Circuit Voltage of A.-C. Arc Welders. S. Oestreicher. *Welding Journal,* v. 28, Apr. 1949, p. 356-357.

Influence on design and performance, using several simplified relationships.

22A-99. Designing for Welding. Part IV. Wallace A. Stanley. *Welding Journal,* v. 28, Apr. 1949, p. 371-372.

Recommendations for projection welding. Some applications. (To be continued.)

22A-100. Safety Precautions in Arc Welding. W. W. Reddie. *Steel,* v. 124, Apr. 25, 1949, p. 86-90.

Practices in construction, installation, and operation of equipment which can help to eliminate damage to workers and property.

22A-101. Remarks on the Article of Acting Member of the Academy of Science of the USSR, N. N. Dobrokhotov: "Interaction of Elements and Oxides in the Welding Bath During Welding of Metals". (In Russian.) M. M. Timofeev. *Avtogennoe Delo* (Welding), Jan. 1949, p. 29-30.

Particular reference to the possibility of the existence of thermodynamic equilibrium during electric-arc welding and the influence of replacing manganous oxide by calcium oxide in the flux on its oxidizing effect.

22A-102. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part II. R. Weck. *Welder,* v. 18, Jan.-Mar. 1949, p. 15-19.

Notch effects. Methods for determining stress concentrations. Multi-axial stresses in the vicinity of a notch.

22A-103. Hartlöten unter Schutzgas. (Hard Soldering Under a Protective Gas.) Karl-August Lohausen. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Feb. 15, 1949, p. 89-93.

A simple method of joining individual metallic parts; different types of electrically heated soldering furnaces and various types of protective gas. Examples of successful use.

22A-104. What Welding Means to America. Part Four. Transportation Equipment. T. B. Jefferson. *Welding Engineer,* v. 34, May 1949, p. 36-38.

Another of a series based on a survey made to determine the extent and kind of welding used in various industries.

22A-105. Trade Names of Copper Electrodes and Comparable AWS Designations. *Welding Engineer,* v. 34, May 1949, p. 49.

A table.

22A-106. New Maintenance System Trims Welder Downtime 80 Per Cent. William J. Scanlon. *Factory Management and Maintenance,* v. 107, May 1949, p. 106-108.

Procedure for inspection and repair of welders which involves a card-index system, inspection and minor repairs in the field, written reports and a careful follow-up and stocking of spare parts.

22A-107. Smooth Regulation of Spot Welding Sets by Means of a Choke in Their Secondary Circuit. A. Z. Blitstein. *Engineers' Digest,* v. 10, Mar. 1949, p. 91-92. Translated and condensed from *Avtogennoe Delo* (Welding), Oct. 1947, p. 6-8.

With theoretical derivations.

22A-108. Quelques aspects de la métallurgie du soudage par résistance. (Some Aspects of the Metallurgy of Resistance Welding.) A. Leroy. *Soudure et Techniques Connexes,* v. 3, Jan.-Feb. 1949, p. 33-45.

Metallurgical phenomena were investigated. Work was done on different types of steel and light alloys. Photomicrographs of seams, welded by different methods, proves the author's theoretical assumptions.

22A-109. Shooting Fasteners. I. E. Madsen. *Fasteners,* v. 5, No. 4, [1949], p. 10-13.

Powder-cartridge rivet-driving tools and their use.

22A-110. Production Processes: Their Influence on Design. Part XLIII. Welding, General Considerations. Roger W. Bolz. *Machine Design,* v. 21, May 1949, p. 119-125.

The various welding methods, indicating principles of selection. Design principles. AWS Summary of Standard Welding Symbols. (Series to be concluded.)

22A-111. Welding Nomenclature and Definitions. W. L. Warner. *Welding Journal,* v. 28, May 1949, p. 427-434.

Some of the basic concepts involved in the formulation of the new "Standard Welding Terms and Their Definitions" which have just been approved. Reasoning leading to the formulation of these terms.

22A-112. Welding Applications in Automotive Construction. John F. Randall. *Welding Journal,* v. 28, May 1949, p. 435-442.

Solution of some high speed production problems by use of specially designed welding equipment.

22A-113. How to Qualify Your Welders. Simon A. Greenberg. *Welding Journal,* v. 28, May 1949, p. 459-461.

Test requirements.

22A-114. The Strength of Silver Alloy Brazed Joints. C. D. Coxe and A. M. Setapen. *Welding Journal,* v. 28, May 1949, p. 462-466.

Strength is influenced by the brazing alloy, its thickness, strength of the metal joined, flux inclusions, and mechanical characteristics of the associated structure. Impact, fatigue, and high-temperature properties of brazed joints.

22A-115. Designing for Welding. Part V. Wallace A. Stanley. *Welding Journal,* v. 28, May 1949, p. 470-471.

Right and wrong designs for projection welding. (To be continued.)

22A-116. Here's How Welding Research and Development Pay Off at the Glenn L. Martin Co. Louis Barrett and Floyd Chitty. *Industry and Welding,* v. 22, May 1949, p. 48-50, 52, 55, 76.

Equipment and procedures, showing improvements on specific jobs discovered by means of research.

22A-117. Metal Coatings Improve Solder Flow on Steel and Brass. David Wallace. *Materials & Methods,* v. 29, May 1949, p. 60-63.

Experience and tests with a number of hot-dipped and electroplated coatings show that plated lead-tin

alloy provides best solderability with rosin flux. Solder spread on various coated brass surfaces. Results after 6 and 9 months aging as well as immediately after plating.

22A-118. Design for Resistance Welding. **E. J. Del Vecchio.** *Tool Engineer,* v. 22, May 1949, p. 21-23.

First of a series on resistance-welding applications. (To be continued.)

22A-119. Treatment of Component Substances in Production of Heavily Coated Electrodes for Arc Welding. (In Russian.) N. Kryukovskii. *Avtogennoe Delo* (Welding), Dec. 1948, p. 6-8.

Materials used for coatings and ferrous alloys for the cores. Optimum conditions of such treatment for individual types of electrodes.

22A-120. Deformation and Stresses Resulting From Discontinuous Welding. (In Russian.) N. O. Okerblom and I. P. Baikova. *Avtogennoe Delo* (Welding), Dec. 1948, p. 16-20.

Investigated from the theoretical point of view, in particular, the character of the zone of thermal influence and deformations and stresses during welding of short seams. Influence of various factors.

22A-121. Radiator Production Mechanized at Ford Motor "River Rouge" Plant. Part II. (Concluded.) *Industrial Heating,* v. 16, May 1949, p. 858-860, 862-863, 865-866.

Final assembly, the solder room, cleaning, testing, painting, paint and water drying oven, and control and safety devices.

22A-122. The Powder Cutting Process for Metals. *Machinery Lloyd* (Overseas Edition), v. 21, May 7, 1949, p. 90-91, 93.

Equipment, procedures, and applications.

22A-123. Soldering as a Production Process Gains Broader Recognition. John A. Evans. *Production Engineering & Management,* v. 23, June 1949, p. 67-70.

Various solder compositions, fluxes, methods, factors in their selection, and applications.

22A-124. Production Processes—Their Influence on Design. Part XLIV. Welding, Design Factors. Roger W. Bolz. *Machine Design,* v. 21, June 1949, p. 135-143.

Extensive treatment of above subject. 44 typical welded-joint combinations are shown schematically and given concise efficiency ratings.

22A-125. What's Wrong With Welding Codes? Part I. L. K. Stringham. *Industry and Welding,* v. 22, June 1949, p. 32-34, 38.

Opinions and recommendations.

22A-126. What Welding Means to America. Part Five. Miscellaneous Metals Industries. T. B. Jefferson. *Welding Engineer,* v. 34, June 1949, p. 33-35.

Presentation of results of a survey. Various classes of scientific instruments and other material not previously discussed.

22A-127. Supervision and Inspection of Welding. F. C. Cocks. *Transactions of the Institute of Welding,* v. 12, Apr. 1949, p. 31-36, 45.

Welding defects, incorrect joint preparation, structural discontinuities, imperfect fusion, undercutting, and other relevant aspects.

22A-128. Ways of Improving Metal-Cutting Tools. (In Russian.) A. E. Prokopovich. *Stanki i Instrument* (Machine Tools and Instruments), v. 20, Jan. 1949, p. 12-15.

Improvement of metal-cutting machines during the year 1948. Recommends, as a way of further improvement, the development of more progressive types of cutting machines, more improved systems of automatic control, and more comprehensive theoretical investigation of the bases of machining, in general.

22A-129. Arc Voltage as Related to Type of Electrode. (In Russian.) A. A. Erokhin. *Avtogennoe Delo* (Welding), Feb. 1949, p. 13-17.

Proposes use of arc voltage at normal arc length for a given electrode and other standard conditions as differentiation characteristics for welding electrodes. Such voltage is called the nominal voltage and depends on electrode composition and coating. A formula determining the specific power consumption per unit weight of melted metal is derived.

22A-130. (Book) **Standard Welding Terms and Their Definitions.** American Welding Society, 33 W. 39th St., New York 18, N. Y. $1.00.

Contains more than 500 terms and defines basic welding concepts.

22A-131. (Book) **Fundamentals of Soft Soldering.** Charles Yerkow. 96 pages. 1949. The Manual Arts Press, Peoria, Ill.

Basic principles and steps. Topics covered include soldering with an iron and with flame burner, soldering various metals, mass-production suggestions, and a job breakdown.

22A-132. (Book) **Pour le soudeur au chalumeau et le découperur.** (For the Gas Welder and Cutter.) L. Mendel. 274 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

A practical instruction manual. Theoretical, chemical, and physical considerations are omitted.

22A-133. (Book) **Pour le soudure a l'arc.** (Manual for Arc Welders.) L. Mendel. 158 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

A practical instruction manual. Four different methods; information on design, preparation for welding, optimum conditions, use of different types of electrodes.

22A-134. (Book) **Svetsteknisk Handbok.** (Handbook of Welding Engineering.) Vol. I and II. H. Swedenborg, O. Forsman, and E. Pelow, editors. 699 and 625 pages. Natur & Kultur, Stockholm, Sweden. 22 Swedish Kr.

Vol. I deals with descriptions of the various processes, welding metallurgy, and the application of welding to various metals. Processes such as brazing and gas cutting. The second volume is concerned with fabrication and design of pressure vessels, shipbuilding, aircraft, railways, machinery, and general structures. Methods of weld testing and joint design for various types of welded structures.

22A-135. (Book) **Praktisches Handbuch der Lichtbogenschweissung.** (Practical Handbook of Electric Arc Welding.) Kth. Dag Du Rietz and Helmut Koch. 300 pages. 1947. Friedr. Vieweg & Sohn, Braunschweig, Germany.

Details of equipment and methods. Methods of testing the strength of welded joints. 384 ref.

22A-136. **Report of Committee D-14 on Adhesives.** *American Society for Testing Materials,* Preprint 64, 1949, 7 pages.

Tentative test method for cleavage strength of metal-to-metal adhesives.

22A-137. **Cutting Torch of Unusual Design; Possible Fuel Gas Economies.** L. A. Hodges and E. Bishop. *Welding,* v. 17, June 1949, p. 242-247.

The heat generated in the burning metal is partially utilized making possible substantial reduction in gas consumption, averaging 57%. Data for various combinations, show savings of 53-67% propane or 30-55% acetylene, and 4-12% oxygen, over a standard torch.

22A-138. **American Fabrication Practice; Some Comments on Production Methods.** E. G. Semler. *Welding,* v. 17, June 1949, p. 260-264.

Deals mainly with welding methods.

22A-139. **Flash and Upset Butt-Welding.** E. J. Del Vecchio. *Tool Engineer,* v. 22, June 1949, p. 32-34.

Speed vs. strength, stock loss, standardization of machine sizes, and carbon vs. weldability.

22A-140. **Sound Welding.** Simon A. Greenberg. *Welding Journal,* v. 28, June 1949, p. 526-530.

Standardization and code activities of American Welding Society.

22A-141. **Jig for Tacking Cylinder Girth Seams.** H. A. Huff, Jr. *Welding Journal,* v. 28, June 1949, p. 560.

22A-142. **Designing for Welding. Part VI.** Wallace A. Stanley. *Welding Journal,* v. 28, June 1949, p. 561-562.

Typical applications of projection welding. A "wrong" design is compared with a better one to emphasize importance to cost and quality.

22A-143. **This Thing Called Weldability.** *Welding Journal,* v. 28, June 1949, p. 246s-264s.

Present knowledge, basis for future research and development, and methods of improved application of present test procedures.

22A-144. **The Porosity of Welds.** J. ter Berg and G. J. van Wijnen. *Welding Journal,* v. 28, June 1949, p. 269s-271s.

Distinction between sulfur-sensitive and sulfur-insensitive welding electrodes.

22A-145. **Final Report: Weld Stress Committee.** E. Chapman. *Welding Journal,* v. 28, June 1949, p. 271s-274s.

General conclusions on effects of welding during the process of making and coating of the weld at ambient temperature. Specific projects.

22A-146. **Welding in Aircraft Construction; A Record of Application and Development.** G. B. Evans. *Aircraft Production,* v. 11, June 1949, p. 200-203.

30 ref.

22A-147. **Hows and Whys of Induction Soldering.** Frank W. Curtis. *American Machinist,* v. 93, June 16, 1949, p. 77-81.

Speeds joint completion and localizes heat. Cleanliness, type of joint, solder, flux, coil design, and material characteristics.

22A-148. **Schweisselektroden.** (Welding Electrodes.) W. Hummitzsch. *Schweisstechnik,* v. 1, Sept. 1947, p. 1-4.

Chemical compositions, physical properties, and uses of different types of electrodes.

22A-149. **Grundsätzliches uber Schrumpfungen und Schrumpfspannungen.** (Principles of Shrinkage and

Shrinkage Stresses.) Friedrich Ostreicher. *Schweisstechnik,* v. 1, June 1947, p. 1-4; Oct. 1947, p. 5-7.

The magnitudes of shrinkages and stresses caused by welding can be determined by a simple calculation: the transverse shrinkage of a seam, and the effect of the temperature and of the size of the welded piece on the magnitude of shrinkage and stress.

22A-150. "Dot-Welder" Ideal Repair Tool. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 30.

Commercial equipment and its applications. Having a depth of penetration of only 1/32 in., the air-pressure unit of the pistol quenches the electrode and arc in a constant stream of cooling air. A patented feature eliminates danger of high heat being developed in the base metal, thereby eliminating the possibility of heat distortion and residual stresses.

22A-151. Resistance Welding; A Survey of Present-Day Practice and Machine Developments. *Automobile Engineer,* v. 39, June 1949, p. 223-230.

Recent machines designed and manufactured by a British firm illustrate the most modern trends in machine design. Three-phase, balanced-load resistance welding.

22A-152. Manual Hidden Arc Welding Applied Advantageously to General Manufacturing Operations. W. R. Persons. *Steel,* v. 125, July 4, 1949, p. 96, 98.

Application to various operations by different companies throughout the country.

22A-153. Dauerstandfestigkeit von Weichlotnähten. (Creep-Stress Resistance of Soft-Solder Joints.) Peter Grassmann. *Zeitschrift fur Metallkunde,* v. 40, Apr. 1949, p. 156.

Experimental graph for a soldered joint using a 42.8% Zn, Pb-Zn solder. Results are discussed and the literature briefly reviewed. Effect of increasing the Zn content to 60% is indicated.

22A-154. Gunstigste Flammeneinstellungen fur schweissbare Stählelegierungen und Nichteisenmetalle. (Optimum Flame Adjustments for Weldable Steel Alloys and Nonferrous Metals.) C. G. Keel and P. Degen. *Zeitscrift fur Schweisstechnik; Journal de la Soudure,* v. 39, June 1949, p. 108-111.

In tabular form.

22A-155. Balanced Waves for Inert-Arc Welding. Part One. R. F. Wyer. *Welding Engineer,* v. 34, July 1949, p. 24-27.

Why the inert-arc process attempts to change alternating into direct current. Methods for avoiding annoying tendency toward current rectification. (To be continued.)

22A-156. Brazing as a Production Process. S. C. Churchill. *Machinery* (London), v. 74, June 23, 1949, p. 835-839.

Advantages and limitations of copper brazing in fully controlled, automatic furnaces. Atmospheres used for brazing, design of parts, strength of brazed joints, use of steel and copper laminations, and brazing of Ni-Cr steel.

22A-157. (Book) **Praktisches Handbuch der gesamten Schweisstechnik. Erster Band. Gasschweiss- und Schneidtechnik.** (Practical Handbook of the Welding Techniques. Vol. I. Gas Welding and Cutting.) Ed. 4. Paul Schimpke and Hans A. Horn. 400 pages. 1948. Springer-Verlag, Berlin, Germany.

Deals with the entire field of welding, including metallography of weldable metals; nature and composition of the gases and gas mixtures; welding equipment; different types of welding joints; expansion, contraction, warping, and phase transformations of the metals during welding.

22A-158. Regulation of Welding Current by Three-Phase Saturable Choke Coils. (In Russian.) N. S. Siunov. *Avtogennoe Delo* (Welding), Mar. 1949, p. 4-6.

May also be used for other purposes. Operating characteristics.

22A-159. The Welding, Brazing and Soldering of Coated Metals. E. V. Beatson. *Steel Processing,* v. 35, June 1949, p. 296-300. A condensation.

Previously abstracted from *Journal of the Electrodepositors' Technical Society,* item 22A-50, 1949.

22A-160. Seam Welding and Miscellaneous Resistance Welding Processes. E. J. Del Vecchio. *Tool Engineer,* v. 23, July 1949, p. 26-27, 31.

Includes section on testing.

22A-161. New Brazing Method for Joining Nonmetallic Materials to Metals. C. S. Pearsall. *Materials & Methods,* v. 30, July 1949, p. 61-62.

One-step brazing process by which ceramics, carbides, and other nonmetallics can be joined to each other or to metals giving a strong lasting bond. This is accomplished by use of certain metal hydrides or special brazing alloys.

22A-162. Strengths of Various Adhesive-Adherend Combinations. *Materials & Methods,* v. 30, July 1949, p. 83, 85. Based on "Comparative Strengths of Some Adhesive-Adherend

Systems," N. J. DeLollis, Nancy Rucker, and J. E. Wier, *National Advisory Committee for Aeronautics*, Technical Note No. 1863, Mar. 1949.

Previously abstracted, item 22A-91, 1949.

22A-163. The Future of Welding and the A.W.S. O. B. J. Fraser. *Welding Journal*, v. 28, July 1949, p. 623-628.

A bright future is predicted for welding and the Society.

22A-164. Arc Welding Safely. W. W. Reddie. *Welding Journal*, v. 28, July 1949, p. 645-650.

Safe practices in construction and installation of equipment and in the execution of the work.

22A-165. Variable Speed Rotary Fixture. H. A. Hupp, Jr. *Welding Journal*, v. 28, July 1949, p. 670-672.

Fixture which acts as a mount for the part and also provides rotary movement around a vertical axis. Welding and brazing of parts is often facilitated by use of such fixtures.

22A-166. Tooling-up for Temperamental Materials. *Modern Industry*, v. 18, July 15, 1949, p. 97-99.

Adapting standard equipment for spot welding stainless steel. In addition, the company has developed a "poke-welder" for tack-welding stainless steel. For gas welding, a new group of fluxes helps reduce oxidation of parts and improve weld quality.

22A-167. Induction Brazing With Silver Alloys Offers Many Advantages and Economies in Fabricating Metal Assemblies. Frank W. Curtis. *Steel*, v. 125, July 18, 1949, p. 82-84, 124-126.

Alloy compositions; relative strengths of joints in relation to their thickness; joint design; and production procedures, equipment, and layout. Speed with which joining temperatures can be obtained, uniformity of heat generation, and economy in heating costs are some of the benefits claimed.

22A-168. Les flux gazeaux dans le soudage, le soudobrasage et le brasage des métaux et alliages. (Gaseous Fluxes in Welding, Weld-Brazing, and Brazing of Metals and Alloys.) B. Liebesman. *Soudure et Techniques Connexes*, v. 3, Mar.-Apr. 1949, p. 75-80.

Proposes use of liquid fluxes, which will be converted into the gaseous state upon heating for welding and brazing. Advantages of the use of such fluxes as compared with solid ones. Methods and apparatus. Results for different metals.

22A-169. Comparison of Radiation from Argon Arc with That of Ordinary A. C. Welding. E. Van Someren and E. C. Rollason. *Transactions of the Institute of Welding*, v. 12, June 1949, p. 52.

Results of measurements.

22A-170. Properties of Some Oil Resistant Adhesives. Gordon F. Lindner, A. F. Schmelzle and Fred Wehmer. *Rubber Age*, v. 65, July 1949, p. 424-426.

Report is confined to adhesives made from Neoprene, Buna N, and Thiokol. Stresses the type of adhesive which gains its strength due to a loss of solvent rather than those which require curing. Variation in adhesion to steel and aluminum with rubber-resin content; shear-test results for various adhesives bonding plasticized polyvinyl chloride; adhesion of three vinyl compounds to aluminum; adhesion to plasticized vinyl sheeting; and comparison of resistance of three adhesives to "813" fuel.

22A-171. Three-Phase, Direct-Energy, Resistance-Welding Equipment. J. H. Cooper. *Welding Journal*, v. 28, Aug. 1949, p. 741-748.

Advantages of dry-disk rectifier or d. c. welders as judged by welder power and welding-current characteristics are said to predominate over the advantages of low-frequency welders.

22A-172. Designing for Welding. Part VIII. Seam Welding. Wallace A. Stanley. *Welding Journal*, v. 28, Aug. 1949, p. 773-774.

22A-173. Welded Airplane. *Welding Engineer*, v. 34, Aug. 1949, p. 25-27.

Welding processes on the 1949 Ryan Navion airplane. Spot, inert-arc, metal-arc, and gas welding; and furnace and induction brazing.

22A-174. Small Pipe Pressure Welded. William C. Henzlik. *Welding Engineer*, v. 34, Aug. 1949, p. 28-29.

Process applied to 1¼-in. wrought-iron pipes for radiant-heating coils.

22A-175. Balanced Waves for Inert Arc Welding. R. F. Wyer. **Part II.** *Welding Engineer*, v. 34, Aug. 1949, p. 30-33.

Contrasts the balanced-wave welder with the radio-frequency-stabilized circuit. Examples of applications of inert-arc welding to Al, Mg, stainless steel, and Cu.

22A-176. Check Your Welding Circuits To Save Money, Get Better Welds and Increase Operator Comfort, Safety and Efficiency. R. L. Townsend. *Industry and Welding*, v. 22, Aug. 1949, p. 30-32, 34.

Recommendations.

22A-177. Arc-Metal-Transfer Analyzer. R. C. McMaster. *Electrical Engineering,* v. 68, Aug. 1949, p. 679-680. A condensation.

A sensitive relay instrument for analyzing welding-arc short circuits caused by metal-transfer. It is a rugged and practical piece of equipment involving no electronic tubes or delicate components. Internal means are provided for calibrating the operating voltages and timing the duration of short circuits. It has been used in extensive studies of welding arcs with different electrode core wires and coating constituents; and appears to be of special value in studying the influence of electrode coatings, constituents, and conditions upon metal transfer during welding.

22A-178. Electrical Advantages of Low-Frequency Welding Converters. C. B. Stadum. *Electrical Engineering,* v. 68, Aug. 1949, p. 680. A condensation.

22A-179. Welding Processes—Uses and Equipment. *Materials & Methods,* v. 30, Aug. 1949, p. 77, 79.

22A-180. Causes and Cures of Some Common Welding Problems. *Tool Engineer,* v. 23, Aug. 1949, p. 47-48.

22A-181. Unusual Attachment Expands Uses of Riveters. *Steel,* v. 125, Aug. 1, 1949, p. 88.

Standard riveters have been converted to drill, countersink and riveting machines in a few hours. Conversion procedure.

22A-182. (Book) **The Headland Welding.** 226 pages. Thos. P. Headland Ltd., 141-142 Lower Marsh, London S.E.1, England. 12s. 6d. net.

Data book consisting of an index and price list, a series of ilustrations, and guide charts for the different welding processes. A comprehensive list of all items required for welding and flame cutting. The charts contain the fullest information relating to the gas, arc, and resistance welding of a very large number of different kinds of steels and certain nonferrous metals.

22A-183. (Book) **Glass-To-Metal Seals.** J. H. Partridge. 238 pages. 1949. Society of Glass Technology, "Elmfield", Northumberland Road, Sheffield 10, England.

All aspects of sealing glasses and metals and the sealing of ceramic materials to metals. Sealing of different glasses to one another and to ceramic materials. Problems of stress in seals and variation of stresses when the devices embodying them are in service.

22A-184. Welding and Brazing. David C. Martin. *Metals Review,* v. 22, Aug. 1949, p. 5-7, 14.

A survey of a year's literature shows a concentration of attention on procedures and techniques. References are to A.S.M. Review of Current Metal Literature.

22A-185. A Survey of Modern Theory on Welding and Weldability. (Continued.) D. Seferian. *Sheet Metal Industries,* v. 26, July 1949, p. 1511-1518, 1526; Aug. 1949, p. 1747-1754, 1760.

July installment: practical characteristics of metallic d.c. and a.c. arcs. Theory of the atomic-hydrogen arc and thermodynamic analysis of the atomic-hydrogen flame. Aug. installment: new and old methods for making arc welds. Ways to calculate weight of weld metal per unit length of arc weld, time per unit length, number of electrodes used per hour, and number of electrodes per kg. of deposited metal. (To be continued.)

22A-186. Plastics in Engineering. W. Nichols. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 68-78.

Assembly gluing technique using British synthetic resin adhesives for bonding metal to wood and metal to metal.

22A-187. Welding Research. H. Martin. *Machinery Lloyd* (Overseas Edition), v. 21, July 30, 1949, p. 85-87.

Various types of metallic arc welding. Developments in pressure welding and activities of the Welding Research Association.

22A-188. Pressure Welding; Recent Developments in the U. S. A. *Welding,* v. 17, Aug. 1949, p. 347-355.

A review. 16 ref.

22A-189. Effect of Brazing Temperatures on Base Metal Properties. S. Damon. *Iron Age,* v. 164, Aug. 25, 1949, p. 67-70, 114.

Effects of heating and cooling cycles encountered in furnace-brazing operations on as-cast and wrought nonferrous metals and wrought carbon and alloy ferrous metals are slighter than anticipated. Studies of an extensive series of both ferrous and nonferrous compositions.

22A-190. Western Welder Fabricates Thin Gauge Containers. *Western Metals,* v. 7, Aug. 1949, p. 23.

Weld fabrication of thin-gage containers of aluminum, stainless steel, carbon steel, monel, and Inconel—in quantity and more economically than possible with deep drawing.

22A-191. Selecting the Correct Electrode. L. K. Stringham. *Sheet Metal Worker,* v. 40, Aug. 1949, p. 37-39, 102.

Applied to arc welding of sheet metal.

22A-192. The Nature of the Arc. J. D. Cobine. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 6-17; discussion p. 18.

Fundamental characteristics of the high-pressure short arc in general, which are applicable to the "welding arc" as well as to other arcs. Some obscure and little-known phenomena. Cathode-spot tracks on Al, Cu, and W are illustrated.

22A-193. New Observations of the Welding Arc at Rensselaer Polytechnic Institute. Lauriston P. Winsor. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 19-30; discussion, p. 31-32.

In connection with an investigation of welding-arc stability, several instruments have been developed for study of arc voltage and current, and power consumed. These are short-circuit counter, short-circuit duration indicator, and RMS deviation meter. Experimental results.

22A-194. Arc Welding Equipment. R. C. Freeman. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 46-49.

Requirements of users.

22A-195. A New Method for Studying the Behavior of High Current Arcs. T. Benjamin Jones. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 50-55; discussion, p. 56-58.

Method consists of establishing an arc between two electrodes, one of which, in the form of a metal tape, is moved at a high speed relative to the other in the form of a rod. The track left by the arc on the tape forms a permanent record of the effects of the arc. This technique permits the power output of the arc at the moving electrode to be "spread out" in space and time under accurate control, so that certain cause and effect aspects of the process can be investigated.

22A-196. Equipment and Techniques in Gas-Shielded Arc Welding. Edward H. Roper. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 73-80.

Includes tabular guide to setting up for gas-shielded arc welding using tungsten electrodes, and schematic diagrams of equipment.

22A-197. Equipment for Inert-Arc Welding. A. U. Welch. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 81-85.

Equipment and procedures.

22A-198. Radio Interference Problems in Welding. C. W. Frick. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 86-94; discussion, p. 95.

22A-199. Frequency Converter Resistance Welding Machine. J. F. Deffenbaugh, J. A. Kuzmack, and F. A. Trinkall. *American Institute of Electrical Engineers,* "Electrical Arc and Resistance Welding", May 1949, p. 107-114, discussion, p. 115.

Preliminary report of experimental work being done to obtain data pertaining to frequency-converter-machine secondary-circuit parameters, secondary wave shapes, effect of the parameters on wave shape, and effect of wave shape on welding ability of the machine. Tables and oscillograms for welding of various steels and Al alloys.

22A-200. Resistance Welding With the Sciaky Three-Phase System. J. L. Solomon. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 116-123; discussion, p. 124-132.

Advantages over other systems.

22A-201. Application of Tri-Phase Metallic Rectifier Machines to Resistance Welding. C. E. Smith. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 133-139.

The 3-phase circuit and welding characteristics.

22A-202. Effect of Electrical Variations on Welding. R. S. Phair. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 203-210; discussion p. 211-212.

A general discussion.

22A-203. Present and Future Use of Resistance Welding. J. H. Cooper. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 256-260; discussion, p. 261-262.

Economic status and future trends.

22A-204. Welding and Metallizing—a Combination for Resurfacing. Walter B. Meyer. *Industry and Welding,* v. 22, Sept. 1949, p. 30-31, 33, 36-39, 41.

22A-205. Metal Bonding. C. J. Moss. *Metal Industry,* v. 75, Aug. 12, 1949, p. 123-125, 132.

The Redux and Araldite processes for bonding metals to metal, wood, and plastic surfaces. The latter requires hardly any pressure while the former requires a lower temperature.

22A-206. Characteristics of Effective Capacity and Efficiency of Contact Welding Machines. (In Russian.) A. Z. Blitshtein. *Avtogennoe Delo* (Welding), Apr. 1949, p. 17-24.

Proposes a new nomographic method. Experimental data prove applicability of the method.

22A-207. Portable Welding Unit for Contact Butt Welding. (In Russian.) M. B. Eksler. *Promyshlennaya Energetika* (Industrial Power), v. 6, Apr. 1949, p. 11-12.

Unit is especially recommended for welding straight and curved tubes of 25 to 85-mm. diameter and wall thicknesses up to 4 mm. Operating characteristics for different tube diameters.

22A-208. Der Fugenhobler und seine Anwendungsmöglichkeiten. (The Groove Cutter and Its Applications.) H. H. Grix. *Schweissen und Schneiden*, v. 1, Mar. 1949, p. 35-44.

A special flame-cutting tool which prepares grooves in the metal. Applications.

22A-209. The Welding Arc. *Metal Progress*, v. 56, Sept. 1949, p. 376, 378, 380, 382. A condensation.

Previously abstracted from *American Institute of Electrical Engineers*, "Electric Arc and Resistance Welding". See item 22A-192, 1949.

22A-210. Automatic Riveting Boosts Production of Small Parts. *Machinery* (American), v. 56, Sept. 1949, p. 183.

Equipment designed for automatically riveting silver contacts to spring steel and bronze arms.

22A-211. Welding Sheet-Metal Components of Turbo-Jet Engines. George H. DeGroat. *Machinery* (American), v. 56, Sept. 1949, p. 184-189.

Rigid quality-control and precision welding methods employed in joining sheet-metal components of the "Turbo-Wasp" engine. (Second of two articles.)

22A-212. Brazing and Soldering; Applications of Metal Powder Technique. H. W. Greenwood. *Metal Industry*, v. 75, Sept. 2, 1949, p. 191-192.

Advantages of powdered brazing and soldering alloys of both low and high-temperature types. Examples of successful applications.

22A-213. Welding and the Future. *Welding*, v. 17, Sept. 1949, p. 369-376.

Future trends are briefly discussed as follows: "Structural Engineering", D. J. Davies; "Aluminum Fabrication", E. G. West; "Aircraft Construction", H. Sutton; "Railway Engineering", H. G. Ivatt and A. H. Peppercorn; "The Chemical Industry", E. Fuchs; "Pressure Vessels", H. B. Fergusson and H. Harris; "Steel Fabrication", A. Robert Jenkins; "The Copper-Using Industries", L. Bernhardt; "Electrical Manufacturing Industries", C. F. Saunders; "Machinery Fabrication", R. C. Lightbourne; "Welding in the Future of Shipbuilding", Denis Rebbeck; and "Trends in Research", H. G. Taylor.

22A-214. (Book) **Electric Arc and Resistance Welding.** 299 pages. May 1949. American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y. $3.50.

Consists of 30 papers and accompanying discussion presented at a conference on electric welding in Detroit, Dec. 6-8, 1948. Pertinent individual papers are separately abstracted.

22A-215. Light Weight Welded Structures—a Challenge to Naval Architects in Ship Design. Samuel Weening. *Journal of the American Society of Naval Engineers*, v. 61, Aug. 1949, p. 555-574.

General discussion and specific problems involved in developing improved designs and methods. 18 ref.

22A-216. Metallizing of Packing Areas. J. E. Wakefield. *Welding Journal*, v. 28, Sept. 1949, p. 875-876.

Procedures for rebuilding worn packing areas on pump shafts, sleeves, rams, plunger, turbine shafts, and other parts.

22A-217. Electrode Coatings Containing Rutile. R. D. Van Zante, T. R. Graham, and R. G. Knickerbocker. *Welding Journal*, v. 28, Sept. 1949, p. 439s-444s.

Progress of an investigation of the Federal Bureau of Mines concerned with the usability of rutile concentrates made from the titania ores of the Magnet Cove district in Arkansas in coating arc welding electrodes. Comparisons were made of electrode performance and mechanical properties of experimentally prepared welding rods using various rutile products for coating.

22A-218. Welding Dissimilar Metals. *Steel*, v. 125, Sept. 26, 1949, p. 72-74, 76.

Problems encountered and their possible solution.

22A-219. Tools, Jigs, and Fixtures for Resistance Welding. R. T. Gillette. *Tool Engineer*, v. 23, Sept. 1949, p. 22-25.

Typical examples.

22A-220. A New Bonding Resin. Detailed Results of Laboratory Tests on "Araldite". M. Ros. *Sheet Metal Industries*, v. 26, Sept. 1949, p. 1967-1984, 1986, 1988.

Mechanical strength and deformation properties of single-lap, double-lap, and butt joints made with Araldite resin on four light alloys, three steels, copper, brass, and phosphor bronze. Effects of immersion of Araldite light-alloy joints in different liquids.

22A-221. Resistance Welding in Industry. W. Koch. *Brown Boveri Review,* v. 36, May-June 1949, p. 201-212.

Equipment, procedures, and applications.

22A-222. How To Bronze-Weld. *Linde Tips,* v. 28, Oct. 1949, p. 77-80.

22A-223. Welding Development in the Royal Dockyards and Shipyards Since 1939. R. Anscomb. *Transactions of the Institute of Welding,* v. 12, Aug. 1949, p. 81-87.

Factors influencing the growth of ship welding and some of the obstacles to further expansion, especially in connection with training of welding engineers, limitations of costs, development of argon arc welding plant, and use of radiography.

22A-224. Tools for Welding. T. B. Jefferson. *Welding Engineer,* v. 34, Oct. 1949, p. 33-42.

Electrode holders, helmets, goggles, cables, connectors, ground clamps, regulators, brushes, clipping hammers, grinding wheels, and others.

22A-225. Dies Can Be Precision Welded. Walter A. Knocke. *Welding Engineer,* v. 34, Oct. 1949, p. 60-62, 72-73.

22A-226. 21 Ways to Lower Arcwelding Costs. Robert Wilson. *Iron Age,* v. 164, Oct. 6, 1949, p. 105-110.

Comprehensive appraisal of 21 specific possibilities, from the standpoint of design, production, and procedure.

22A-227. New Resins Provide Practical Bonding Agents for Metals. E. Preiswerk, K. Meyerhans, and E. Denz. *Materials & Methods,* v. 30, Oct. 1949, p. 64-66.

How durable, high-strength bonds joining metals, nonmetals, and their combinations are made possible by use of ethoxyline resins called "Araldites".

22A-228. Developments in Metallizing for Volume Output of Parts. John E. Wakefield. *Production Engineering & Management,* v. 24, Oct. 1949, p. 63-67.

Advantages and applications.

22A-229. Instruments for Studying the Welding Arc. L. P. Winsor, L. M. Schetky, and R. A. Wyant. *Electrical Engineering,* v. 68, Oct. 1949, p. 873.

Instruments used to study the welding arc over a wide range of arc current and voltage, and for a variety of electrode coatings. Preliminary results indicate that the instrumentation is capable of distinguishing between different types of electrodes and different test conditions.

22A-230. Can You Use Resistance Welding To Cut Costs, Increase Production? *Machine and Tool Blue Book,* v. 45, Oct. 1949, p. 101-104.

How it can be done in typical cases.

22A-231. Aluminum-Vinyl "Cold Solder" Has Interesting Possibilities for Industry. Edwin Laird Cady. *Materials & Methods,* v. 30, Oct. 1949, p. 77-79.

Putty-like filler pastes composed of Al-powder and vinyl resin have many potential uses as a repair material for metals.

22A-232. Circuit Analysis of Frequency-Changer Welders. W. K. Boice. *Welding Journal,* v. 28, Oct. 1949, p. 946-956.

Analysis of the principal electrical characteristics of the main power circuits. Electrical advantages.

22A-233. Lowering Cost of Welded Construction. Omer Blodgett. *Welding Journal,* v. 28, Oct. 1949, p. 957-964.

How it can be accomplished by selection of larger electrodes, use of higher current, intermittent welding, and smaller size fillets. These savings can be further augmented by suitable bending, fitting, and cutting operations and by use of subassemblies.

22A-234. Jigging for Welding Cylinder Seams. *Welding Journal,* v. 28, Oct. 1949, p. 980.

Simple jigging method.

22A-235. The Statistical Part in Welding Investigations. B. B. Day. *Welding Journal,* v. 28, Oct. 1949, p. 449s-461s.

Advantages to be obtained by use of the science of statistics in planning of investigations. Methods, with emphasis on the "factorial" method. 20 ref.

22A-236. Heat Effects in Anode Spots of High-Current Arcs. T. B. Jones, W. B. Kouwenhoven, and Merrill Skolnik. *Welding Journal,* v. 28, Oct. 1949, p. 461s-465s.

Proposed method for evaluating the rate of energy input to the anode surface. Correlation of melting rates with standard heat-flow equations may be possible.

22A-237. Electrical Resistance Offered to Nonuniform Current Flow. W. B. Kouwenhoven and W. T. Sackett, Jr. *Welding Journal,* v. 28, Oct. 1949, p. 466s-470s.

Results of a study of the phenomenon of spreading resistance and its contribution to the total resistance of contacts. They are of importance in resistance welding and in other

applications such as electrical contacts and switches.

22A-238. Slope Control in Spot and Projection Welding. Ivar W. Johnson. *Welding Journal,* v. 28, Oct. 1949, p. 471s-476s.

Proper control of initial application of current facilitates projection welding of Al and reduces electrode pickup in spot welding Al and coated steels.

22A-239. (Book) **Welding and Cutting Manual.** 208 pages. 1949. Linde Air Products Co., 30 E. 42nd St., New York. $1.80.

Useful for reference and instruction for repairmen, farmers, garage mechanics, and maintenance men. Sections on use of oxy-acetylene equipment, methods of welding, cutting, heating, bending, brazing, and soldering, and numerous hints and shortcuts.

22A-240. Welding. Improved Techniques Multiply Uses. W. A. Saylor. *Western Metals,* v. 7, Oct. 1949, p. 35-38.

Welding in general. New process, introduced for welding heavy sections, which uses a consumable electrode of the same composition as the material being welded. Submerged-arc welding, weld cracking, and structure restraint.

22A-241. Needles and Pens. Lee H. Judge. *Welding Engineer,* v. 34, Nov. 1949, p. 23.

Use of resistance welding to join the precious-metal tip to the shank of a phonograph needle or the nib of a pen.

22A-242. Welded Steam Generator. William C. Henzlik. *Welding Engineer,* v. 34, Nov. 1949, p. 29-33.

Design and fabrication of generator used to provide steam heat and hot water on diesel-powered streamliners.

22A-243. Rectified D-C Welding. T. B. Jefferson. *Welding Engineer,* v. 34, Nov. 1949, p. 39.

New machine using a full-wave rectifier with a conventional three-phase transformer.

22A-244. Welding and Cutting Fumes. Clyde B. Clason. *Welding Engineer,* v. 34, Oct. 1949, p. 46-50; Nov. 1949, p. 34-38.

Surveys current literature on fume hazards for various metals and alloys. 26 ref.

22A-245. Modular Panels of Armorply. Light-Gage Metal Bonded to Plywood Prefabricated for Walk-In Coolers. *Sheet Metal Worker,* v. 41, Oct. 1949, p. 41-42.

The facing material is 28-gage stainless, electrolytic Zn-coated steel or 0.016-in. Al. The metal is bonded to the plywood with a special glue under high pressure.

22A-246. Glass-To-Metal Seals: The Applications of Iron-Nickel-Cobalt Alloys. *Metal Industry,* v. 75, Sept. 30, 1949, p. 263-266; Oct. 7, 1949, p. 292-293.

Problems involved, including types of seals, types of glasses, and types of metals and alloys.

22A-247. Zur Theorie des Brennschneidens. (The Theory of Flame Cutting.) Peter Grassmann. *Zeitschrift für angewandte Physik,* v. 1, Aug. 1949, p. 449-454.

Principle of flame cutting as applied to metals. Correlation of cutting rate with thickness of material and oxygen pressure. Further research required.

22A-248. Über die Gestaltung von Schweisskonstruktionen. (Weld Design.) K. Bobek. *Archiv für Metallkunde,* v. 3, Sept. 1949, p. 301-305.

Principles of design.

22A-249. Automatic Flash Butt Welding and Certain of Its Electrical Characteristics. (In Russian.) A. M. Lushmikov. *Avtogennoe Delo* (Welding), May 1949, p. 7-9.

Device to be attached to a regular butt-welding machine. Optimum conditions of operations.

22A-250. New Heavy-Duty Torch for Surface Cutting. (In Russian.) S. G. Guzov. *Avtogennoe Delo* (Welding), May 1949, p. 25-27.

Newly designed oxygen-cutting torch. Optimum conditions of operation.

22A-251. Submerged Arc Welding Coil Ends. *Iron Age,* v. 164, Nov. 10, 1949, p. 87.

Semi-automatic strip splicer, designed for welding together the sheared ends of strip coils to form a continuous strand through processing lines and for subsequent cold reduction.

22A-252. Inert-Gas Welding. H. A. Huff, Jr., and A. N. Kugler. *Canadian Metals and Metallurgical Industries,* v. 12, Sept. 1949, p. 16-19, 39; Oct. 1949, p. 16-19, 30-32, 36.

A descriptive review.

22A-253. Polyisocyanates in Bonding. T. J. Meyrick and J. T. Watts. *IRI Transactions,* v. 25, Oct. 1949, p. 150-166.

Experimental work on the technological applications of mixtures of rubbers and polyisocyanates in the bonding of natural and synthetic rubbers to textiles, to metals and to miscellaneous plastics, ceramics, and wood. No satisfactory method has

been found for bonding rubber to copper, stainless steel, or phosphor bronze. 11 ref.

22A-254. Solid-Phase Bonding of Aluminum Alloys to Steel. V. W. Cooke and A. Levy. *Journal of Metals,* v. 1, sec. 1, Nov. 1949, p. 28-35.

Three procedures which are said to give very high bond strengths. These are the twisting, the hot-press, and the shear procedure. Variables investigated were bonding temperature, pressure, surface preparation, deformation, composition, and subsequent heat treatment. Application to other metal combinations is suggested.

22A-255. Welding Copper To Other Metals Speeded Up By New Process. Dan Reebel. *Steel,* v. 125, Nov. 14, 1949, p. 84-86.

Equipment and method for welding copper to copper or copper to steel in which no outside source of heat is required. Known as the Cadweld process, it is similar to Thermit welding except that iron oxide has been replaced by copper oxide. Applications have been worked out where connections can be made to flat and curved surfaces in both horizontal and vertical planes and in a range of wire sizes from No. 14 through 2000 MCM.

22A-256. Hard-To-Weld Ironbase Metals, As Well As Many Dissimilar Metals and Alloys May Be Economically Joined and Hardfaced With These Special Types of Bronze Electrodes. F. E. Garriott. *Industry and Welding,* v. 22, Nov. 1949, p. 40-42, 46-47.

Deals with Al bronze electrodes.

22A-257. The Argonarc Welding Process. R. R. Sillifant and W. A. Woollcott. *Welding,* v. 17, Oct. 1949, p. 430-441; Nov. 1949, p. 493-506.

Fundamentals; characteristics of d.c. and a.c. argon-shielded arcs; British equipment and methods of welding. Concluding installment: Manual and argon-arc welding of different materials.

22A-258. Gelötete Schienenverbinder. (Soldered Rail-Cable Connections.) R. Gunnert. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 3, Mar. 1949, p. 43-47.

The problem of soldering or welding copper cables to adjoining rail ends on electrified railways. A soldering device that prevents overheating of cable and cable shoe.

22A-259. Moisture Resistance of Electrode Coatings. (In Russian.) E. D. Lonskii. *Avtogennoe Delo* (Welding), June 1949, p. 17-20.

A series of coated electrodes used in the U.S.S.R. were investigated for moisture pick-up during storage. This amounted to 3-5%, but apparently did not affect weld qualities.

22A-260. Automatic Testing of Arc Welding Electrodes. *Iron Age,* v. 164, Nov. 24, 1949, p. 73-74.

Apparatus eliminating entirely the human factor, developed by the Naval Engineering Experimental Station at Annapolis.

22A-261. High-Current Arcs. *Metal Progress,* v. 56, Nov. 1949, p. 738, 740, 742. Condensed from "The High-Current Carbon Arc and Its Mechanism", by Wolfgang Finkelnburg, *Journal of Applied Physics,* v. 20, May 1949, p. 468-474.

Properties of the contracted arc stream and a general theory. Application to arc welding.

22A-262. Correctly Designed Jigs and Fixtures Can Cut Welding Costs. *Steel,* v. 125, Nov. 28, 1949, p. 62-65.

Correct selection of materials, including use of nonmagnetic cast iron; provision for water cooling, electrode wear, ease of loading. Details of fixtures for specific cases.

22A-263. Welding Process Extended to Stainless Steel Applications. *Steel,* v. 125, Nov. 28, 1949, p. 75.

Aircomatic process has been successfully applied to Cr-Ni and stainless steels and to Al bronzes. The process involves continuous feeding of a coiled-wire electrode in a gaseous shield through the barrel of a welding gun.

22A-264. Limits of Welding Positions. W. L. Warner. *Welding Journal,* v. 28, Nov. 1949, p. 1040-1042.

It is often desirable from the standpoint of inspection, procedure, control, or production planning that the dividing lines to distinguish between positions be established. A basis for standardization is offered.

22A-265. Controlled Distortion—An Aid to Metal Working. Joe L. Morris. *Welding Journal,* v. 28, Nov. 1949, p. 1080-1082.

Several of the many ways in which distortion resulting from controlled heat applications may be applied advantageously in welding and other fabrication.

22A-266. Development of Specimen Simulating Weld Heat-Affected Zones. Ernest F. Nippes and Warren F. Savage. *Welding Journal,* v. 28, Nov. 1949, p. 534s-546s.

Design and construction of a time-temperature control device for exact duplication of weld heat-affected

structures for testing purposes. Typical data records and recommendations for further work.

22A-267. Comparison of Radiation From Argon-Arc Welding With That of Metallic-Arc Welding. E. van Someren and E. C. Rollason. *Welding Journal,* v. 28, Nov. 1949, p. 566s.

See abstract from *Transactions of the Institute of Welding,* item 22A-169, 1949.

22A-268. Welding in the U.S.S.R. *Welding,* v. 17, Nov. 1949, p. 476-485.

Correlated review of a number of papers recently published in the Russian journal *Avtogennoe Delo.* 31 ref.

22A-269. Power Supply for Metal Arc Welding. C. A. Kershaw. *Welding,* v. 17, Nov. 1949, p. 486-492.

Welding characteristics of both a.c. and d.c. supply systems are considered with reference to developments which have taken place to overcome the disadvantages of a.c. Effects of introducing condensers for power-factor correction are discussed together with the question of unbalance on the 3-phase mains when using single-phase welding transformers.

22A-270. Cyc-Arc Stud Welding. *Machinery* (London), v. 75, Nov. 10, 1949, p. 681-682.

Procedure and equipment.

22A-271. A Survey of Principles, Applications and Developments of the Argon-Arc Welding Process. W. K. B. Marshall. *Sheet Metal Industries,* v. 26, Nov. 1949, p. 2427-2432, 2434, 2436, 2438, 2440.

Arc characteristics, equipment, design and technique, application to various metals, economics, advantages and disadvantages, and new developments.

22A-272. La conception des appareils à pression soudés à double enveloppe. (The Design of Equipment for Pressure Welding of "Double-Envelope" Joints.) H. Gerbeaux. *Soudure et Techniques Connexes,* v. 3, May-June 1949, p. 101-114.

Equipment consisting of two parallel shells joined together at the edges to form a closed system, such as a vacuum jacket, requires special welding apparatus and technique for construction. Various types of these joints as applied to different vessels. Mathematical analysis of stresses and strains developed and results of their experimental investigation.

22A-273. The Use of Jigs, Fixtures, Clamps, Positioning and Turning Equipment, and Operator Safety and Comfort Are Important Factors When You Are Aiming at Lower Welding Costs. Clayton B. Herrick. *Industry and Welding,* v. 22, Dec. 1949, p. 20, 23-24, 44, 46.

22A-274. High Production of Small Compressors. Part II. Paul M. Giles. *Industry and Welding,* v. 22, Oct. 1949, p. 36, 46.

Soft soldering, induction heating shrink fit, four-station dial feed, and compressor assembly. (To be concluded.)

22A-275. Argon-Arc Welding; A Survey of the Process and Recent Developments. W. K. B. Marshall. *Automobile Engineer,* v. 39, Nov. 1949, p. 493-495.

See abstract from *Sheet Metal Industries,* item 22A-271, 1949.

22A-276. Standardized Equipment for Resistance Welding. Wallace A. Stanley. *Welding Engineer,* v. 34, Dec. 1949, p. 34-40, 42.

Summary of chief types of welding machines and power-supply systems.

22A-277. Dies and Press for Jointing Steel-Cored Aluminium Cables. *Engineering,* v. 168, Nov. 18, 1949, p. 529-531.

Equipment is said to overcome difficulties inherent in previous methods and to insure good electrical and mechanical continuity of both the steel and the aluminum sections.

22A-278. Stud Welding. C. C. Macfarlane. *Transactions of the Institute of Welding,* v. 12, Oct. 1949, p. 110-115.

Four types of modern stud-welding equipment, and results achieved in a wide range of applications.

22A-279. The Reclamation of Worn Parts. Sheila M. Holgate. *Journal of the Birmingham Metallurgical Society,* v. 29, Sept. 1949, p. 173-186.

The three basic methods for rebuilding surfaces worn down by friction and abrasion are: welding, electrodeposition, and metal spraying. Application to both ferrous and nonferrous base metals. 27 ref.

22A-280. Un aspect curieux de microstructure d'une soudure autogène. (A Curious Aspect of the Microstructure of an Autogenous Weld.) H. Figour. *Revue de Métallurgie,* v. 46, Aug. 1949, p. 637-638.

Two welds were made in Fe-Ni-Co alloy sheet 1 mm. thick. One was made with the ordinary oxy-acetylene torch procedure; the other in an argon atmosphere. Mechanical polishing revealed no difference in structure, but etching revealed a peculiar cellular structure in the former samples.

22A-281. Les flux gazeux. (Gaseous Fluxes.) B. Liebesmann. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 39, Nov. 1949, p. 198-201.

See abstract of "Gaseous Fluxes in Welding, Weld-Brazing, and Brazing of Metals and Alloys" (in German) from *Soudure et Techniques Connexes,* item 22A-168, 1949.

22A-282. Das Festigkeitsverhalten von Schweissungen. (The Strength Behavior of Welds.) E. Siebel. *Schweissen und Schneiden,* v. 1, Aug. 1949, p. 121-128.

Several problems, especially effects of local distortions and internal stresses. Methods and apparatus for measuring internal stresses.

22A-283. Method for Determination of Basic Criteria of the Electrode-Melting Process, During Electric-Arc Welding. (In Russian.) G. D. Shwchenko. *Avtogennoe Delo* (Welding), July 1949, p. 16.

Theoretical method of determining coefficients of fusion and of deposition of electrode metal in grams per ampere-hour of arc combustion.

22A-284. Temperature of the Welding Arc. (In Russian.) K. K. Khrenov. *Avtogennoe Delo* (Welding), Aug. 1949, p. 14-15.

Derivation of well-known equation $T = kV_i$ where T is the temperature of the gas column in the arc, V_i is the average effective ionization potential of the arc gas, and k is a constant.

22A-285. A New Flame Cutter. L. G. Buckle. *Engineers' Digest,* v. 10, Nov. 1949, p. 403-404.

New hand torch developed by a British firm. It is designed to take advantage of the heat provided by the metal in combustion thus reducing gas consumption. Oxygen savings of 11-40% and fuel-gas savings of 43-84% are reported on the basis of experiences of various organizations.

22A-286. Heliarc and Railroad Applications. H. E. Gannett. *Welding Journal,* v. 28, Dec. 1949, p. 1147-1151.

Use in repair of cast iron and aluminum parts.

22A-287. Analyzing Metal Transfer in Arc Welding. R. C. McMaster, D. C. Martin, and A. Leatherman. *Welding Journal,* v. 28, Dec. 1949, p. 575s-583s.

Gives details of new instrument developed for the above. It is particularly well suited to studies of the influence of coating constituents on arc stability and metal transfer. 34 ref. (See abstract of condensed version, *Electrical Engineering,* item 22A-177, 1949.)

22A-288. Details of Some Recent Developments in the Joining of Sheet Material by Spring-Joint Methods. W. Cookson. *Sheet Metal Industries,* v. 26, Dec. 1949, p. 2573-2576.

New types of spring and lock joints and their use in erection of an Al-alloy house, of Al-alloy partitions, and Al roofing. It has been possible to develop joint members made of sheet material, so designed that sufficient spring action is obtained to enable them to be sprung together without overstraining, by hand pressure, to make a tight joint. (To be continued.)

22A-289. Causes and Cures of Common Welding Problems. *Materials & Methods,* v. 30, Dec. 1949, p. 83, 85.

Summarized in tabular form.

22A-290. The Progress of Structural Welding. Arsham Arimikian. *Industry and Welding,* v. 22, Dec. 1949, p. 36-38, 47.

Review of progress and suggestions for improvements. (To be continued.)

22B—Ferrous

22B-1. Welding for Porcelain Enameling. L. K. Stringham. *Iron Age,* v. 162, Dec. 16, 1948, p. 90-94.

How the need for annealing and stress relieving weldments prior to firing porcelain-enameled products has been eliminated by use of the inorganic lime-ferritic electrode for open arc welding and submerged melt welding. Bubbles caused by hydrogen absorption can be eliminated through proper use of these welding media. Procedure, design, material, preparation, and welding methods.

22B-2. Repairing Leaks in a Fluid Cat Cracker By Arc Welding During Operation. Robert H. Darling. *Chemical Engineering,* v. 55, Dec. 1948, p. 133-134.

22B-3. Repairing Gray Iron Castings by Welding. L. Ames. *Iron Age,* v. 162, Dec. 23, 1948, p. 46-51.

Methods and applications.

22B-4. Submerged Melt Welding in Steel Mills. E. D. Morris. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 85-88.

Advantages and applications.

22B-5. Submerged Melt Welding; Structural Steel Sections. J. M. Tippett. *Steel,* v. 123, Dec. 27, 1948, p. 58-60, 91.

22B-6. Carrousel Assembles & Welds Large Dispenser Drums. *American Machinist,* v. 92, Dec. 30, 1948, p. 80-82.

Setup includes power and gravity conveying, plus an automatic transfer mechanism.

22B-7. The Application of Arc Welding to Agricultural Machinery Re-

pairs. A. W. Williams. *Welder,* v. 17, July-Sept. 1948, p. 50-51.

22B-8. Repair to a Large Cast Iron Pinion Wheel. *Welder,* v. 17, July-Sept. 1948, p. 52-53.

22B-9. Repair of Battle Damage to Armoured Fighting Vehicles. G. W. G. Harmer. *Welder,* v. 17, July-Sept. 1948, p. 54-55.

22B-10. Electric Arc Welding on the French National Railways. R. Biais. *Welder,* v. 17, July-Sept. 1948, p. 56-63.

22B-11. Welded Fabrication in the Electrical Motor Industry. W. H. Y. Masters. *Welder,* v. 17, July-Sept. 1948, p. 64-67.

22B-12. A Welded Jig for Aircraft Components. A. C. Hart. *Welder,* v. 17, July-Sept. 1948, p. 69-70.

22B-13. Welded Shells for Blast Furnaces. (In Russian.) B. L. Sheinkin and V. L. Tsegel'skii. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 1-5.

Structural and welding details.

22B-14. Deformation of the Shells of Blast Furnaces During Welding. (In Russian.) V. I. Mel'nik and R. G. Shneiderov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 6-9.

Apparatus used to determine the above and tabulated data on the results obtained.

22B-15. Investigation of Several Types of Electrodes for Electric Arc Welding of Type "E.Ya.1-T." Steel. (In Russian.) E. M. Lapitskaya and I. N. Gerasimenko. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 12-14.

Proposes several methods to avoid the intercrystalline corrosion of high Ni-Cr steel of the 18-8 and 25-20 types when ordinary electrodes are used.

22B-16. Semi-Automatic Machine for Gas Cutting of Steel Sheet 100-300 Mm. in Thickness. (In Russian.) G. M. Kazanov and V. A. Toropov. *Avtogennoe Delo* (Welding), no. 9, Sept. 1948, p. 26-27.

Optimum conditions of operation for different thicknesses are indicated.

22B-17. Concerning Thickness of the Coatings on "UONI-13" Electrodes. (In Russian.) D. M. Levykin. *Avtogennoe Delo* (Welding), Sept. 1948, p. 28.

The influence of the thickness of the coating on the mechanical properties of welds made.

22B-18. Repairs Hydro Adjustable Blade Turbines by Welding. Joel B. Justin and Ed. T. Davis. *American Society of Mechanical Engineers,* Advance Copy, Paper No. 48-F-1, 1948, 13 pages.

Welding with stainless steel and using precast-blade stainless-clad inserts.

22B-19. Rotating Fixture Facilitates Tank Welding. *Iron Age,* v. 162, Dec. 30, 1948, p. 40.

22B-20. The Part Played by Oxygen and Nitrogen in Arc Welding. J. D. Fast. *Philips Technical Review,* v. 10, July 1948, p. 26-34.

The action of oxygen and nitrogen on iron and steel is dealt with as an introduction to a discussion of the function of the coating of welding electrodes. An estimation of the solubility of oxygen and nitrogen in liquid and solid iron; their harmful and beneficial effects in electric welding; and the role of the carbon-oxygen reaction. 19 ref.

22B-21. Trusses for Electronics Park Buildings. H. L. Waugh. *Welding Engineer,* v. 34, Jan. 1949, p. 36-39.

Steel roof trusses with welded joints used in buildings of G.E.'s new project near Syracuse.

22B-22. Hard-Facing Takes to Powder. Lawrence A. Holtgren and Richard E. Parker. *Welding Engineer,* v. 34, Jan. 1949, p. 40-43.

Use of powder sprayed through flame especially for such steels as the AISI 400 series.

22B-23. Seam Welding Speeds Transformers. Walter Rudolph. *Welding Engineer,* v. 34, Jan. 1949, p. 44-45.

Use of seam welding in production of transformers by Westinghouse.

22B-24. Stud Welding at Stove Plant. W. R. Brewer. *Welding Engineer,* v. 34, Jan. 1949, p. 49.

Use to attach lighting fixtures, wiring, and sprinkler pipe to steel floor beams.

22B-25. Big Jobs in Plant Maintenance. *Welding Engineer,* v. 34, Jan. 1949, p. 63.

Welding repair of bell support housing slide for the top of a blast furnace; gray-iron skip engine bedplate which was redesigned for welded fabrication from 1½-in. hot rolled steel plates.

22B-26. Build Tanks With Plate Buggies. Max Alth. *Welding Engineer,* v. 34, Jan. 1949, p. 64.

Device used for tank-erecting jobs in which space doesn't permit use of a crane.

22B-27. Here's How Welding Research and Development Pay Off at American Car and Foundry Co. E. A. Watson. *Industry and Welding,* v. 22, Jan. 1949, p. 40-41, 44, 46, 48.

22B-28. Motor Car Production. 2. Manufacture of the Arc Welded Austin

A40 Chassis. *Welding,* v. 16, Dec. 1948, p. 511-518.

22B-29. Contact Arc Welding; Applications of a New Type of Electrode. *Welding,* v. 16, Dec. 1948, p. 519-523.

Properties and applications of electrodes developed by Philips in Holland.

22B-30. The Liege Congress; Advances in Bridge & Structural Engineering. S. M. Reisser. *Welding,* v. 16, Dec. 1948, p. 524-526.

Progress of welded design in the construction of steel structures.

22B-31. Heliarc Welding Automobile Fenders. Herbert Chase. *Iron Age,* v. 163, Jan. 13, 1949, p. 51-53.

Inert-gas-shielded-arc welding is being used to weld together two stampings for front fender of the new Oldsmobile. Filler metal is used where fitting is poor, but the bulk of the welding is with tungsten electrodes.

22B-32. Some Metallurgical Aspects of Austenitic Welds. C. T. Gayley. *Welding Journal,* v. 28, Jan. 1949, p. 24-30.

The principal characteristics considered are: tendency to crater cracking, root cracking, intergranular cracking, lamellar structure of the weld metal, directional properties, and effect of cold working and recrystallization.

22B-33. The Economies of Hardfacing. J. J. Barry and Albert Muller. *Welding Journal,* v. 28, Jan. 1949, p. 31-37.

Advantages of hard facing; problems in the correct selection of the proper hard facing rod. Design and cost figures.

22B-34. Effects of Arsenic on the Weldabilities of Steels. Harujio Sekiguchi, Seiichi Ando, Kazuo Hotta, and Yoshikazu Moriwaki. *Welding Journal,* v. 28, Jan. 1949, p. 53-54. Condensed from *Journal of the Japan Welding Society,* nos. 6-7, 1948.

Results of investigation.

22B-35. Chrome Steel in Locomotive Firebox Applications. Howard L. Miller. *Welding Journal,* v. 28, Jan. 1949, p. 55-59.

Experimental and production work in the welding of 18% Cr steel plates.

22B-36. Valve Repair. Paul C. Mingee. *Welding Journal,* v. 28, Jan. 1949, p. 60.

Unusual welding procedure followed in reconstruction of large cast-iron valve.

22B-37. Welded Press Speeds Production of Road Grader. Harry P. Krull. *Welding Journal,* v. 28, Jan. 1949, p. 61-62.

Design and fabrication of special forming press.

22B-38. Notch Sensitivity of Welded Steel Plate. R. D. Stout and L. J. McGeady. *Welding Journal,* v. 28, Jan. 1949, p. 1s-9s.

The properties of various compositions of steel plates as affected by welding conditions and treatments. Phases considered include: origin of crack formation as affected by compositions, welding conditions, and postheating; effect of normalizing temperature on prime plate and welded plate; factors affecting ductility and fracture transition temperatures; and significance of ductility vs. mode of fracture as criteria of the transitional behavior of structural steels.

22B-39. Further Studies in Projection Welding. W. F. Hess, W. J. Childs, and R. F. Underhill, Jr. *Welding Journal,* v. 28, Jan. 1949, p. 15s-23s.

Projection welding of 0.040-in. AISI 1010, 1015, and 1020 steels was investigated. Variables of weld time, weld current, electrode force, projection size and shape, and their effect on weld formation and strength.

22B-40. Impact Tests of Pressure Vessels at —320° F. T. N. Armstrong. *Welding Journal,* v. 28, Jan. 1949, p. 34s-40s.

Results of tests of welded pressure vessels of 8½% Ni steel under shock loading at the temperature of liquid nitrogen in comparison with carbon and stainless steel vessels.

22B-41. Tensile Tests of Small-Scale Welded Joints. T. D. Tuft. *Welding Journal,* v. 28, Jan. 1949, p. 41s-48s.

The relative effectiveness of Everdur brazing and steel welding in joining thin metal sections. Helium shielding improves strength and ductility of brazed joints.

22B-42. Defects in Tube Welds Made by Flash Welding. (In Russian.) A. N. Pogromskii. *Kotloturbostroenie* (Boiler and Turbine Manufacture), July-Aug. 1948, p. 24-29.

Typical defects in flash-welded boiler tubes and basic factors causing such defects. Methods for minimizing them.

22B-43. Ship Welding and the Influence of Residual Stress. C. H. Stocks and J. W. G. Thurston. *Welding,* v. 16, Dec. 1948, p. 533-538.

A general view of stresses in welded ship structures, and an investigation carried out to determine some of the effects and causes of

residual stresses. Indications as to factors causing such stresses. (To be continued.)

22B-44 (Book). **Design of Welded Steel Structures. Ed. 2.** A. R. Moon. 134 pages. 1948. Sir Isaac Pitman & Sons, Ltd., Parker St., Kingsway, London W.C.2, England. 18s.

Textbook provides in concise form the necessary practical information which enables engineers and designers of constructional steelwork to make effective use of welding process. It covers the essentials of good design, metals suitable for welding, weld forms, and welding procedures. Typical joints and structural units are worked out and hints for avoiding distortion in the finished work are given.

22B-45. Wider Steel Sheets by Automatic Welding. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 39.

Special machine developed by Ford Motor Co. for seam welding of two narrow sheets to produce the wide sheet required for underbody stampings.

22B-46. Some Interesting Phases of Cadillac Bumper Production. Joseph Geschelin. *Automotive Industries,* v. 100, Jan. 15, 1949, p. 40-41, 82.

Welding, finishing, and plating operations.

22B-47. Repairs to Welded Tanker "Hyalina". E. J. Hunter. *Transactions of the Institute of Welding,* v. 11, Dec. 1948, p. 212-215.

22B-48. Submerged Arc Skip Welding Ring Gears to Stamped Flywheels. S. M. Spice. *Iron Age,* v. 163, Jan. 27, 1949, p. 68-71.

By development of special controls and timing devices, automatic submerged-arc welding equipment was adopted by Buick to make a series of 2-in. long welds that join a ring gear to a stamped steel flywheel. Production has been increased 400%, weld rejections have been almost eliminated, and distortion is easily held within rigid limits.

22B-49. Design and Fabrication of a Welded Tubular Steel Boom. A. Scott and E. McMinn. *Welding,* v. 17, Jan. 1949, p. 2-8.

Design and fabrication of a welded tubular boom 113 ft. in length and weighing, with fittings, 6.06 tons.

22B-50. The Future of Welding in Shipbuilding. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 73-75.

Introduction by Charles S. Lillicrap, and brief discussions by Wilfrid Ayre, Archibald Hurd, J. M. Ormston, John Crighton, and J. L. Adam.

22B-51. Economies of Welding in Shipbuilding. J. W. Rudkin. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 78-80.

Quantitative data on the above.

22B-52. Radiography as Used in Naval Construction for the Control of the Quality of Welding. D. W. Smithers. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 81-90.

22B-53. Some Problems Associated With the Development of Light Gauge Metallic Arc Welding. E. S. Waddington. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1829-1836, 1840.

Equipment and procedures. Includes tables of welder settings and electrode specifications for stainless. Confined to ferrous sheet.

22B-54. The Metallurgical Aspects of Fusion Welding in Relation to the Weldability of Steels. (Concluded.) H. Granjon. *Sheet Metal Industries,* v. 25, Sept. 1948, p. 1837-1840.

The heat treatment of weldments as compared with ordinary heat treatment. Indicates unsolved problems. 13 ref.

22B-55. The Hard-Facing of Punches and Dies. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 137-138.

Use of Stellite-faced punches and dies. Design of blank for a typical hot-blanking die.

22B-56. Contact Arc-Welding; A Description of a New Technique. P. C. van der Willigen. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 155-160, 168.

New method developed in Holland during and after World War II.

22B-57. Welded Fittings Fabricated From Flat Steel Plate. *Iron Age,* v. 163, Feb. 3, 1949, p. 121.

Fabrication procedure used in making fittings for 8-50 in. diameter natural-gas pipeline.

22B-58. Welding Angle-Irons Without Clamps. Gustaf S. Beckman. *Machinery* (American), v. 55, Feb. 1949, p. 201.

Partial cutting and bending technique.

22B-59. Studwelding—A Versatile Metal Fastening Process. Robert C. Singleton. *Materials & Methods,* v. 29, Feb. 1949, p. 66-69.

Process eliminates drilling and tapping operations.

22B-60. Automatic Brazing Speeds Output of Steel-Finned Condensers. Jay DeEulis. *Steel,* v. 124, Feb. 7, 1949, p. 92-95.

22B-61. English Weld Cracking Test: New Method of Checking High-Tensile Steels. *Steel,* v. 124, Feb. 7, 1949,

p. 120, 122, 124, 127. Based on paper by P. L. J. Leder, *Iron and Coal Trades Review.*

See abstract from *Engineering,* item 22b-214, 1948.

22B-62. Welding Saves 20% in Steel in Cat-Cracker Equipment. *Petroleum Processing,* v. 4, Feb. 1949, p. 139-144. Based on "Design Progress and Economy in Welded Fluid Catalytic Cracking Plant," by Egon F. Brummerstedt.

Improvements made, through use of electric welding, in the mechanical design of a modern fluid catalytic cracking plant.

22B-63. How to Cut Clad Steels. Leonard W. Williams. *Industry and Welding,* v. 22, Feb. 1949, p. 30-32.

Recommended procedures.

22B-64. When to Braze or Fusion Weld Cast Iron. K. H. Koopman. *Industry and Welding,* v. 22, Feb. 1949, p. 34, 36, 38, 40-41, 62.

How to choose the best of the above two methods for a specific job. Table shows simple tests for identifying cast iron.

22B-65. Are You Welding Alloy Steel? T. N. Armstrong. *Industry and Welding,* v. 22, Feb. 1949, p. 42-44, 63-64.

Recommended procedures.

22B-66. Welding of Broom Machine Frame Reduces Weight and Cost. *Modern Machine Shop,* v. 21, Feb. 1949, p. 186, 188.

22B-67. Vibrated Electrode Holder. C. K. Wilson. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 126-128.

A special welding tool was designed to produce a low-cost safety tread on steel. Held and pointed like a pistol, this tool deposits a hard, wear resistant bead.

22B-68. Stud Welding Cuts Costs. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 136, 138, 204.

Three examples from production of electric water heaters which show cost reduction through use of welded studs for mounting heating elements.

22B-69. Riveted vs. Welded Ship Structure. E. M. MacCutcheon. *Welding Journal,* v. 28, Feb. 1949, p. 111-117; discussion, p. 118-122.

Investigations of the cracking of merchant ships during World War II have uncovered new evidence bearing on the relative incidence of cracks in ship structures fabricated by riveting and by welding. It is concluded that there is no evidence indicating that either riveted or welded structure is more susceptible to the inception of cracks.

22B-70. Fabrication of Structural Steel Sections. J. M. Tippett. *Welding Journal,* v. 28, Feb. 1949, p. 123-127.

How large and unusual structural sections may be fabricated by submerged-melt welding.

22B-71. Welding Alloy Steels for High-Temperature Service. M. E. Holmberg. *Welding Journal,* v. 28, Feb. 1949, p. 141-148.

Based principally on study of failures in welded alloy structures. Limited to processing equipment such as used in gasoline plants and refineries, mostly piping. Various types of service failures. Design for welding and alloy selection.

22B-72. Stoves Fabricated by Resistance Welding. Robert C. Glatz. *Welding Engineer,* v. 34, Feb. 1949, p. 42-43.

Procedures and equipment.

22B-73. Electric Locomotives for Brazil. K. P. O'Kelly. *Welding Engineer,* v. 34, Feb. 1949, p. 49-51.

Welded construction.

22B-74. Brazing Big Wheel. Phil Glanzer. *Welding Engineer,* v. 34, Feb. 1949, p. 62.

Repair of a cracked roller casting 26 in. in diameter.

22B-75. Ship Welding and the Influence of Residual Stress. (Concluded.) C. H. Stocks and J. W. G. Thurston. **Welding,** v. 17, Jan. 1949, p. 30-37.

See abstract of first installment, item 22B-43, 1949.

22B-76. First Production Example of High Speed, Skip Welding. *Automotive Industries,* v. 100, Feb. 15, 1949, p. 46, 70.

Above process of the Buick Motor Div. of G. M. as developed in connection with Lincolnweld submerged arc welding.

22B-77. Tin Cans Grow in Brooklyn. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 47-48.

Principal operations are soldering and forming.

22B-78. Laboratory Tests of Two Welded Rails. R. E. Cramer. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 510-512.

A test of one welded rail was made for comparison with previous tests, placing the rail head in repeated tension; and another test was made with the base in repeated tension for comparison with rolling-load tests of bolted joints. Welded rail found superior.

22B-79. Welded Underwater Passageway. Bill Kolb. *Industry and Welding,* v. 22, Mar. 1949, p. 38-40, 69-71.

Welding of sections for vehicular tunnel being built under the Houston Ship Channel.

22B-80. Here's How GATX Tanks Are Made. O. H. Kuhlke. *Industry and Welding,* v. 22, Mar. 1949, p. 44-46, 48, 52.

Welding fabrication of tank cars.

22B-81. Reduction Gear Teeth Cut to Tolerances of One Ten-Thousandth of an Inch. *Steel,* v. 124, Mar. 7, 1949, p. 126.

Welding and machining in fabrication of 7½-ton gear for marine turbine-propulsion unit.

22B-82. Wrought Iron Welding Is Different. Thomas Trail. *Industry and Power,* v. 56, Mar. 1949, p. 78-80, 114.

Bead and layer welding methods, oxyacetylene, electric arc procedures, and flame cutting.

22B-83. Bethlehem Thermit Weld Repairs Ship in 72 Hours. *Western Metals,* v. 7, Feb. 1949, p. 32.

22B-84. Ship Structural Members; Comparison of Welded and Riveted Stiffeners. *Welding,* v. 17, Feb. 1949, p. 78-80. Based on paper by C. J. G. Jensen.

Results of tests on various structural combinations.

22B-85. New Welding Process Feeds Wire Through Welding Gun. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 166-167.

"Aircomatic" process for welding heavy sections of Al and Al alloys at wire feed speeds ranging from 100 to 300 in. per min.

22B-86. Significance of Speed in Automatic Arcwelding. John H. Hruska. *Iron Age,* v. 163, Mar. 10, 1949, p. 98-102.

Research into problems of crack sensitivity of parent metals and welding rods, low-temperature shock resistance, and other metallurgical properties, may often obscure the fundamentals of making good welds. The speed factor, by manual or automatic processes, must be given attention. Design factors are ranked next in importance.

22B-87. Hoover Dam Turbines Kept Turning. Fred M. Burt. *Welding Engineer,* v. 34, Mar. 1949, p. 33-35.

Methods and equipment used to apply stainless steel inlays to wear surfaces of turbine runners and wicket gates, which are rapidly eaten away by cavitation caused by a 500-ft. head of water.

22B-88. Vans Welded on Assembly Line. Gerald Eldridge Stedman. *Welding Engineer,* v. 34, Mar. 1949, p. 36-39.

Apparatus and technique.

22B-89. Better Motor Mount Costs Less. *Welding Engineer,* v. 34, Mar. 1949, p. 46-47.

New welded motor mount for the Maytag electric washer.

22B-90. Prefabricated Skeletons for Building. Ted Palmer. *Welding Engineer,* v. 34, Mar. 1949, p. 52-53.

Production of reinforcing panels for concrete construction on a giant "loom" in which the threads are ⅜ and ¼-in. rods. Separate panels, produced in manageable sizes, are welded together at the field site.

22B-91. La fatigue des soudures. (Fatigue of Welds.) M. Ros. *Revue de Métallurgie,* v. 45, Nov. 1948, p. 421-446.

Theoretical evaluation of the quality of welds in steel independent of type of weld and of alloy joined. Method of calculation of theoretical data, particularly with respect to fatigue strength.

22B-92. Specialized Steel Mill Cutting Machines and Controls. R. F. Helmkamp and A. H. Yoch. *Welding Journal,* v. 28, Mar. 1949, p. 213-219.

Equipment and controls for handling hot materials on or off the roll line as well as gas supply and control systems.

22B-93. Welding Highway Bridges. John F. Willis. *Welding Journal,* v. 28, Mar. 1949, p. 219-221.

Some welded bridge structures either completed, under construction or soon to be advertised in the Connecticut Highway System.

22B-94. Flexible Welded Connections for Structural Steel. Emanuel Scheyer. *Welding Journal,* v. 28, Mar. 1949, p. 234-238.

New welded connections suitable for semirigid and rigid framing, as compared with the older types.

22B-95. Resistance Welding of Jet Engines. H. E. Lardge. *Welding Journal,* v. 28, Mar. 1949, p. 249-254.

The application of spot, stitch, and seam welding to jet engines. Early experiences leading to present-day applications and techniques.

22B-96. Corrosion Resistance of Powder-Cut Stainless Steels. L. E. Stark and C. R. Bishop. *Welding Journal,* v. 28, Mar. 1949, p. 104s-115s.

The heat-affected zone of powder-cut edges may be eliminated by using stabilized or extra low carbon stainless steels or by annealing the powder-cut unstabilized stainless steels. The zone may be minimized by water-quenching simultaneously with the cutting.

22B-97. Tests of Spot Welds for Light Steel Structures. Otto Graf. *Welding Journal,* v. 28, Mar. 1949, p. 116s-120s. Translated from *Zeitschrift Verein Deutscher Ingenieure,* 1949.

Substitution of plug or spot welds

in place of riveted joints for light structures, especially when subjected to repeated tensile loads.

22B-98. Steel Properties Related to Welded Performance. J. Heuschkel. *Welding Journal,* v. 28, Mar. 1949, p. 135s-152s.

Total carbon and alloy content is shown to be the basic variable influencing postwelded deformation and energy absorption capacities of welded tee-joints under concentrated stress at both normal and subzero temperatures. Effects of rolling conditions, variations in quench rates resulting from variations in welding, and weld shape. Optimum prewelded yield and ultimate strengths and pre and post-welding hardness ranges at normal and at subzero temperatures for nine steel compositions. A composite relation between total analysis and welded performance under both normal and subzero test conditions.

22B-99. Here's How Welding Research and Development Pay Off at Lukens Steel Co. Part I. W. G. Theisinger. *Industry and Welding,* v. 22, Mar. 1949, p. 26-31.

Various profitable results obtained. (To be concluded.)

22B-100. Residual Stresses Due to Welding. R. Weck. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 119-129; discussion, p. 398-431.

Plastic deformations and residual stresses occurring in mild steel plates joined by butt welds were measured with the Tomlinson strain gage in the immediate vicinity of the weld. The stresses were found to be near the yield point, and it is believed that stresses of this magnitude are always present in welded steel. Effects of various procedural variations. Brittle failure sometimes ascribed to residual stresses appears to be due to faulty design and unsuitable material. Evidence suggests that fatigue strength may be affected by residual stresses.

22B-101. The Stress System Causing Hard-Zone Cracking in Welded Alloy Steels. J. A. Wheeler. *Institute of Metals,* Symposium on Internal Stresses in Metals and Alloys, 1948, p. 367-373; discussion, p. 463-484.

Mechanical properties of metal which cracks in relation to the stresses which act on it. Cracking can be accounted for by the combined action of macro and microstresses on a material embrittled by heating to high temperatures during welding. 11 ref.

22B-102. Peculiarities of Heat Processes and Size of the Welding Spot During Welding of Structural Steels. (In Russian.) A. S. Gel'man. *Avtogennoe Delo* (Welding), Nov. 1948, p. 8-13.

The dimensions of the spot determining its mechanical strength are limited by the zone of melting of the base metal and, therefore, are directly connected with the heating process. Analysis of such processes and other factors involved.

22B-103. Welded Construction Using Steels Having Different Plastic Properties. (In Russian.) G. P. Mikhailov and A. Z. Solomonikov. *Avtogennoe Delo* (Welding), Nov. 1948, p. 15.

Recommended design factors.

22B-104. The Problem of the Mechanical Properties of Metals During the Welding Process. (In Russian.) N. N. Prokhorov and P. M. Lyubalin. *Avtogennoe Delo* (Welding), Nov. 1948, p. 16-18.

The ductilities of steels of both pearlite and austenite type were investigated at temperatures approaching those of welding (1000-1400° C.) and also between 25 and 200° C. The dependence of ductility on different factors.

22B-105. Rapid Welding With Deep Penetration in the Molotov Dnieperpetrovsk Factory. (In Russian.) D. P. Lebed and D. V. Shatailo. *Avtogennoe Delo* (Welding), Nov. 1948, p. 22-23.

Optimum operating conditions and mechanical properties of welded joints.

22B-106. Melting Out and Repair of Defects in Steel Castings by Means of Arc-Welding Equipment. (In Russian.) S. V. Begun. *Avtogennoe Delo* (Welding), Nov. 1948, p. 25-26.

Small and medium-sized surface defects are first melted out, then new metal is deposited.

22B-107. Arc Welding and Flame Cutting—An Aid to Production. E. F. Gill. *Sheet Metal Industries,* v. 26, Mar. 1949, p. 606-608.

Savings achieved on a specific steel casting.

22B-108. Fusion Welding and Cutting of Alloy Steel as Used in Modern Steam Locomotive Boilers, and Report on Welded Boilers Now in Service. *Master Boiler Makers' Association, Official Proceedings,* 1948, p. 87-128.

Part One is devoted to the practical aspects of the welded boilers. Part Two is devoted to the metallurgical and technical phases of welding alloy steels that might be used in the construction of welded boilers. Includes the following papers: "Steels and Edge Preparation

of Same for the Construction of Welded Boilers," A. J. Raymo; "Welding Test of Nickel Steel for Use in Locomotive Boilers," J. W. Crossett; "Notes on the Weldability and Mechanical Properties of Manganese-Vanadium Plate Steel," T. W. Merrill; "Fusion Welding and Cutting of Alloy Steel for Locomotive Boilers," Howard L. Miller; "Welding of Chromium-Molybdenum Alloy Steel Pressure Piping," E. R. Seabloom; and "High Temperature Applications of Alloys in Boiler Design and Manufacture," M. C. Jessen.

22B-109. Making Rings of Stainless Steel. R. Groves. *Metallurgia*, v. 39, Feb. 1949, p. 217-219.

A method of manufacture in which two half-rings are joined by pressure welding; and advantage and limitations of the process.

22B-110. The Thermit Process; Developments — Applications — Possibilities. *Welding*, v. 17, Mar. 1949, p. 94-103.

Principles and progress of thermit welding. Examples of some important modern applications of the process both in Britain and overseas. Reconditioning of rolling-mill housings and stern-frame repairs.

22B-111. Motor Car Production. 3. Assembly Methods at Vauxhall Motors, Ltd. *Welding*, v. 17, Mar. 1949, p. 105-116.

Emphasis is on welding jigs.

22B-112. Untersuchungen zur Metallurgie des Ellira-Schweissverfahrens. (Research on the Metallurgy of the Ellira Welding Process.) Friedrich Bischof. *Stahl und Eisen*, v. 68, Feb. 26, 1948, p. 92-93.

Reviews recent German literature on submerged-melt process. 14 ref.

22B-113. Stand der Zusatzwerkstoffe fur die Eisenschweissung. (Additives Used in the Welding of Iron.) K. L. Zeyen. *Zeitschrift des Vereines Deutscher Ingenieure*, new ser., v. 90, June 1948, p. 185-190.

A survey of German, English, Russian, and American welding-rod improvements since the beginning of World War II, with special emphasis on the effect of phosphorus, sulfur, and hydrogen on the quality of the weld. 25 ref.

22B-114. Conductors Stress-Relieve Welds. C. C. Roberts. *American Machinist*, v. 93, Apr. 7, 1949, p. 97.

Use of electric cables wrapped around welded pipe joints for preheating, stress-relief, and controlled cooling. Includes thermocouples and temperature controller.

22B-115. Soldering. *Nature*, v. 163, Mar. 19, 1949, p. 459. Based on talk by W. R. Lewis.

Recent developments in theory and practice.

22B-116. Pipe Lines Across the Desert. Elton Sterrett. *Welding Engineer*, v. 34, Apr. 1949, p. 33-35.

Procedures for joining high-tensile alloy steel pipe.

22B-117. From Plate to Penstocks. Fred M. Burt. *Welding Engineer*, v. 34, Apr. 1949, p. 40-43.

Equipment and procedures. Operations include fabrication of 15-ft. penstocks and large vessels for oil refining.

22B-118. Arc-Welded Jack Steps Up Production. Harry P. Krull. *Welding Engineer*, v. 34, Apr. 1949, p. 44-45.

Fabrication of roller floor jack to support transfer case and transmission for assembly in a road grader.

22B-119. Welded Steel Forms Build Bridge Supports. Herbert Leopold. *Welding Engineer*, v. 34, Apr. 1949, p. 52-53.

Steel forms fabricated by arc welding used in construction of Australian bridge.

22B-120. Welding 4 to 6 pct. Chrome Pipe. *Iron Age*, v. 163, Apr. 7, 1949, p. 102.

Satisfactory procedure for large oil-refinery piping.

22B-121. Economy of Steel and Cast Iron by Welding. *Transactions of the Institute of Welding*, v. 12, Feb. 1949, p. 3-9.

Committee report. Bridge building, electrical, general, marine and structural engineering, shipbuilding and other applications of welding processes. Cost data.

22B-122. Short Time Phenomena in the Iron Welding Arc. Metal Bridging and Short Circuiting of the Arc. L. H. Orton and J. C. Needham. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), Feb. 1949, p. 17r-24r.

Existence of the phenomena in a d.c. downhand welding-type iron arc and in a.c. welding. Short-circuiting phenomena were recorded oscillographically. These short circuits are arbitrarily divided into four classes according to their durations. The mode of occurrence and the characteristics of these phenomena. Possible explanations.

22B-123. Welding of Railroad Cars Simplified by Use of Huge Positioners. John W. Sheffer. *Machinery*, v. 55, Apr. 1949, p. 160-163.

22B-124. Furnace Brazing Small Steel Parts. I. H. M. Webber. *Industrial Heating,* v. 16, Mar. 1949, p. 402-404, 406, 408, 410, 412, 418.

Procedures developed to improve quality, shorten manufacturing cycles, and reduce costs. Numerous cases were found where forgings, castings, and parts machined from bar stock could be fabricated from less expensive components. Describes specific cases, including methods previously used. (To be continued.)

22B-125. Speeds Welding 25% With Heavier Current. Delbert Craven. *Industry and Welding,* v. 22, Apr. 1949, p. 45.

Installation of 500-amp. AC Fleetwelders which eliminate arc blow and speed welding. Welds are said to be more easily made and of higher quality.

22B-126. New Brazing Techniques for Auto Bodies and Fenders. Carl E. Jacobs. *Industry and Welding,* v. 22, Apr. 1949, p. 46-48, 50.

Procedures include removal of scale with flame, piercing holes in sheet, aligning, and tacking.

22B-127. Assembly Operations in Motor Car Body Production. *Machinery* (London), v. 74, Mar. 24, 1949, p. 359-365.

Layout equipment, and procedures. The bulk of the assembly work consists of welding using a wide range of equipment sizes.

22B-128. Redesigning Metal Parts for Electric Furnace Brazing. H. M. Webber. *Materials & Methods,* v. 29, Apr. 1949, p. 58-62.

Careful redesign permits combining inexpensive metal forms into low-cost fabricated products of complex design. Use of copper brazing on low-alloy and stainless steels.

22B-129. Beitrag zur Frage der Schweissbarkeit der Hoch- und Bruckenbaustähle. (The Weldability of Structural Steels.) A. Legat. *Schweisstechnik,* v. 2, Jan. 1948, p. 5-8; Feb. 1948, p. 15-18.

The metallurgy of weldable structural steels. Effects of melting method, of type and quantity of the deoxidizing agent, of grain structure, and of alloying ingredients. 28 ref.

22B-130. Zur Frage der Beanspruchbarkeit verschieden dicker Kahlnähte. (The Problem of Stress of Fillet Weld Seams of Varying Thicknesses.) H. Melhardt. *Schweisstechnik,* v. 2, Apr. 1948, p. 37-39.

Determination of tensile-stress properties of fillet welds by mathematical and experimental methods. Methods of calculating strength values.

22B-131. Die Praxis der Gusseisenschweissung. (Cast Iron Welding.) Valentin Trunschitz. *Schweisstechnik,* v. 2, Apr. 1948, p. 43-46.

Methods.

22B-132. Stumpf - und Kehlnahtverbindungen bei ruhender und bei wechselnder Beanspruchung. (Butt and Fillet Joints Under Static and Alternating Stresses.) H. Melhardt. *Schweisstechnik,* v. 2, May 1948, p. 55-57; June 1948, p. 72-75.

A partial comparative evaluation of test results on welded joints. The inclination of the δ_0-line in the fatigue-strength diagram and Babeck's coefficients for the seam form.

22B-133. Das Schweissen von rost-, säure- und hitzebeständigen Stählen. (The Welding of Rust, Acid, and Heat Resistant Steels.) W. Hummitzsch. *Schweisstechnik,* v. 2, Oct. 1948, p. 119-128.

Basic data on the properties of the above steels and their preparation for welding, welding methods, and welding rods. The Arcatom and Argonarc processes. A method of soldering rust and acid resistant steels.

22B-134. (Book.) **Oxygen Cutting: A Comprehensive Study of Modern Practice in Manual and Machine Cutting.** E. Seymour Semper. 150 pages. Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E. 1, England. 10s. 6d. (postage 5d.).

Approaches subject mainly from the practical side, although the theoretical has not been neglected.

22B-135. (Book.) **Hardfacing by Welding.** M. Riddihough. 127 pages. Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E. 1, England.

Hardfacing Rods and Their Development; Designing the Deposit; Designing for Specific Jobs; Characteristics of the Metals Commonly Used for Blanks; Preheating and Cooling; Heat Treatment for Hardfacing Various Types of Metals; Equipment and Jigs for Hardfacing; Hardfacing Techniques; Inspecting, Machining and Grinding the Deposit; Estimating and Planning. Appendix lists details of English and American hardfacing materials.

22B-136. Factors Influencing the Weldability of High Tensile Alloy Steels, and a New Weld Cracking Test. P. L. J. Leder. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 40, 1948, p. 173-186; discussion, p. 186-190.

See abstract of condensed version in *Engineering,* item 22b-214, 1948.

22B-137. How to Weld Pipe. *Linde Tips,* v. 28, Apr. 1949, p. 29-33.

Recommended procedures for steel pipe.

22B-138. Investigation of Welded Ship Construction. J. Lyell Wilson. *Welding Journal,* v. 28, Apr. 1949, p. 319-328.

Briefly evaluates some research of the Ship Structure Committee. General design, details of construction, fabrication, and materials. 21 ref.

22B-139. The Metallurgy of Arc Welding in Steel. R. D. Stout. *Welding Journal,* v. 28, Apr. 1949, p. 335-352.

Some basic metallurgical principles involved in arc welding. The fusion process, weld solidification, weld shrinkage in hot and cold forming, heat treatment, and physical properties vs. microstructure.

22B-140. Welded Units for a Vehicular Tunnel. Clyde M. Leavitt. *Welding Journal,* v. 28, Apr. 1949, p. 353-356.

Fabrication and field erection of tunnel sections. Similarity with ship construction.

22B-141. Techniques for Auto Body and Fender Brazing. Carl E. Jacobs. *Welding Journal,* v. 28; Apr. 1949, p. 365-367.

New procedures that are said to cut costs, broaden field of application, and permit inexpensive repairs which formerly were impractical.

22B-142. Hints for Hard Facing. H. B. Gilson. *Welding Journal,* v. 28, Apr. 1949, p. 368-369.

Recommendations for cast iron.

22B-143. Badly Fractured Cast-Iron Gear Box Repaired. Donn Boring. *Welding Journal,* v. 28, Apr. 1949, p. 369.

Repair with Ampco-Trode 10 aluminum-bronze electrodes.

22B-144. Development of Weldable High-Strength Steels. C. E. Sims and H. M. Banta. *Welding Journal,* v. 28, Apr. 1949, p. 178s-192s.

Underbead cracking in steel which is caused by release of hydrogen concentrations. It was found that quenched and untempered low-carbon martensite is quite ductile. The influence of composition on underbead cracking and strength.

22B-145. 164 Welds in 32 Seconds. *Steel,* v. 124, Apr. 18, 1949, p. 87.

Automatic multiple-spot welding machine used in the fabrication of steel homes.

22B-146. Welding Increases Bobbin Capacity. *Iron Age,* v. 163, Apr. 28, 1948, p. 71.

Method used to increase bobbin size to handle 8 oz. of thread instead of 3½ oz., using the old rolls and hangers.

22B-147. Verschleissfestigkeit und Wirtschaftlichkeit von Auftragsschweissungen. (Wear Resistance and Economy of Hard Facing Materials.) Hans Wahl. *Metalloberfläche,* v. 2, Aug. 1948, p. 169-170.

The problem of the best hard-facing material for a given type of wear, also the type that is most desirable from the cost standpoint. A testing machine.

22B-148. Experimental Welding of Rail-Joints in India by Thermalite Process. Phiroz Meherji Dalal. *Science & Engineering,* v. 2, Jan. 1949, p. 7-11.

Method and its advantages. Composition of the "Thermalite" compound.

22B-149. Special Electrodes for Depositing Cutting Edges on Cutting Tools. V. V. Danilevsky. *Engineers' Digest,* v. 10, Jan. 1949, p. 26. Translated and condensed from *Avtogennoe Delo* (Welding), Feb. 1948, p. 26-27.

Previously abstracted from original item 22b-146, 1948.

22B-150. Some Aspects of the Welding of Cast Iron. *Welder,* v. 18, Jan.-Mar. 1949, p. 2-5.

Preheating, cooling, peening, welding procedure, applications, light-stress cracks, high-stress fractures, and electrodes.

22B-151. Repairs to Marine Diesel Engines in Shanghai. *Welder,* v. 18, Jan.-Mar. 1949, p. 6.

22B-152. Welded Pressure Vessels. Nicol Gross. *Welder,* v. 18, Jan.-Mar. 1949, p. 8-11.

Stress conditions and production of various types. X-ray and mechanical tests required.

22B-153. Hard Facing Hammers Subject to Impact and Abrasion. *Welder,* v. 18, Jan.-Mar. 1949, p. 12-13.

Reinforcement of hammers of the "Flextooth" metal-turnings crushers by the electric welding process.

22B-154. Furnace Brazing Small Steel Parts. II. H. M. Webber. *Industrial Heating,* v. 16, Apr. 1949, p. 600, 602, 604, 606, 608, 610, 744, 746.

Application to magneto governor housing; magneto impulse coupling plate; and fuel-injection-pump part. Equipment used for furnace brazing and its operation.

22B-155. Mill Housings; Successful Repairs by Thermit Welding. *Iron and Steel,* v. 22, Apr. 1949, p. 124-126.

22B-156. Arc Welding Offers Progress in Machinery Manufacture and Structural Building. C. G. Herbruck. *Steel Processing,* v. 35, Apr. 1949, p. 191-195.

22B-157. New Life for Lumber Carriage Knees. Wilbur C. Smith. *Welding Engineer,* v. 34, May 1949, p. 21.

Binding and galling was resulting

in field repairs and lost operating time. Bearing surfaces are now overlaid with aluminum bronze during manufacture.

22B-158. Thermit Welding Repairs a Cracked Stern Frame. Margaret Ralston. *Welding Engineer,* v. 34, May 1949, p. 26-27.

22B-159. 200-Ft Spans Field Welded. Henry W. Young. *Welding Engineer,* v. 34, May 1949, p. 28-29.

Fabrication of structural members for large transit shed.

22B-160. "Welding-Through" Joins Sheet Metal. H. E. Cable. *Welding Engineer,* v. 34, May 1949, p. 30-31.

Automatic hidden-arc welding of 20-gage flanged halves simplifies production of gastight radiation chambers for heating units. Welds are made through the flanges like spot welds at a speed of 120 in. per min.

22B-161. Welding on the Farm. Phil Glanzer. *Welding Engineer,* v. 34, May 1949, p. 32-33.

Miscellaneous repair applications.

22B-162. "Hot Welding" Steam Cylinders in Germany. John J. Christie. *Welding Engineer,* v. 34, May 1949, p. 39.

German method of arc welding in which a carbon mold is built about the work. The space left between the carbon plates is filled with weld metal by the metal-arc process.

22B-163. World's Largest Pipe Welder. Clyde B. Clason. *Welding Engineer,* v. 34, May 1949, p. 42, 44.

Pipe up to 16-in. diam. can be butt welded in continuous production in a new tube mill built for service in Argentina. The electrode wheels are 54 in. in diam. and weigh 2000 lb.

22B-164. Flame Shape-Cutting in Railroad Shop Operations. F. B. Rykoskey. *Railway Mechanical Engineer,* v. 123, May 1949, p. 253-255.

Flame cutting produces savings in duplicating parts, and flux-cutting eliminates clamping.

22B-165. Cam Shape Determines Contour of Gear Teeth. *Product Engineering,* v. 20, May 1949, p. 102.

Machine which automatically flame cuts gears and sprockets without the use of templets. A cam and pantograph arrangement controls the cutting motion. The cam determines the tooth contour: Adjustments are provided so that several hundred different tooth contours may be traced from any one of the 20 basic cams.

22B-166. Modern Welding Procedures in Building Motor Car Bodies. E. O. Courtemanche. *Machine and Tool Blue Book,* v. 45, May 1949, p. 121-122, 124, 126-132.

Progress toward more automatic equipment for welding. Procedure, equipment, and technique employed.

22B-167. Shift to AC Welders Saves Power. Fred B. Mead and F. V. Schilling. *Iron Age,* v. 163, May 5, 1949, p. 98-99.

By replacing 27 d.c. welders with a.c. welders, fabricator was able to realize its capital investment in 20 months from power savings alone.

22B-168. Furnace Brazing Improves Refrigerator Parts. Walt Rudolph. *American Machinist,* v. 93, May 5, 1949, p. 96-97.

Sound, gas-tight joints are produced, and substantial time savings effected in joining tubing to steel backplate.

22B-169. Mesure du retrait dans l'assemblage de poutrelles par soudure. (Determination of Contraction in Welded Structures.) H. Gerbeaux. *Soudure et Techniques Connexes,* v. 3, Jan.-Feb. 1949, p. 11-18, 45.

Stresses and deformations in soft-steel arc-welded structures as affected by different welding sequences. Method of investigation.

22B-170. Statische und dynamische Festigkeitsuntersuchungen an Pumktschweissverbindungen aus hochfesten Stahlfeinblechen. (Static and Dynamic Strength Tests of Spot-Welded Joints in Light-Gage Sheet Steel.) Viktor Hauk. *Archiv fur das Eisenhuttenwesen,* v. 20, Jan.-Feb. 1949, p. 41-51.

Optimum welding conditions for two different low-carbon steels by testing the static-strength properties of the sheets welded under different conditions. Photomicrographs show structures of the weld samples in the untreated and annealed states.

22B-171. Hardness and Wear Resistance—Hard Surfacing by Fusion Welding. Howard S. Avery. *"Engineering Laminates"* (John Wiley & Sons, 1949), p. 483-550.

Selection and application of hard-surfacing welding rods. Welding techniques mentioned briefly. Compositions; properties; structures, corrosion resistance; and methods for hard facing and for welding rod manufacture. Abrasion testing and abrasion resistances of numerous weld deposits. 40 ref.

22B-172. The Influence of Core Wire on the Characteristics of Low Carbon Steel Welding Electrodes. D. C. Martin, C. B. Voldrich, and P. J. Rieppel. *American Iron and Steel Institute,* Preprint, 1949, 62 pages.

Results of research done during 1946-1948, inclusive. Data are based

on many hundreds of tests of core wires from various types of steel, and from various locations in the heat and in the ingot. Tests were made with bare-wire electrodes, and with covered wires representative of three widely used classes of low-carbon steel-covered electrodes. Various types of tests were made in all welding positions by several operators, and also with automatic welding machines.

22B-173. Flame-Cutting Stainless Steel by New Method. *Welding Journal,* v. 28, May 1949, p. 468.

Oxweld powder-cutting process proved to be a quick and efficient method to accurately cut holes in the curved side of a stainless-steel tank.

22B-174. How to Repair Grate Bars. F. C. Geibig. *Welding Journal,* v. 28, May 1949, p. 469-470.

Recommended procedures for welding repair.

22B-175. Mechanized Flame-Cutting Lengths of Pipe. A. H. Wilson. *Welding Journal,* v. 28, May 1949, p. 471-472.

Simple set-up.

22B-176. Resistance Welding at Work. *Welding Journal,* v. 28, May 1949, p. 474.

Application to production of motor housings.

22B-177. Stud Welding Cuts Plumbing Costs. *Welding Journal,* v. 28, May 1949, p. 475.

Use in installation of bathroom and kitchen plumbing fixtures.

22B-178. Effect of "Quench Time" on Weld Metal. Jay Bland. *Welding Journal,* v. 28, May 1949, p. 216s-226s.

Results of various postwelding quench times on the ductility of all-weld-metal tensile coupons prepared with Type E6011 electrodes. An attempt is made to explain the presence of fissures causing low ductilities in specimens quenched within 1-3 min. after welding. Some evidence for considering retained dissolved hydrogen to be the cause of fissure formation.

22B-179. Several Steel Forms Combined in Heavy-Duty Weldments. Kenneth Rose. *Materials & Methods,* v. 29, May 1949, p. 49-51.

Large diesel crankcases built up of steel forgings, plate, tubing, and bar stock. They are said to have advantages of light weight, lower cost, and longer service life.

22B-180. Are You Welding Light Gauge Tubing? C. E. Deig. *Industry and Welding,* v. 22, May 1949, p. 30-33, 69-73.

Procedures and equipment used in manufacture of gas refrigerators. Tubing used conforms roughly to SAE 1010 specification.

22B-181. Tips on Hardsurfacing. Part I. M. Riddibough. *Industry and Welding,* v. 22, May 1949, p. 34-35, 37-38, 40.

First installment covers design of the weld deposit. (To be continued.)

22B-182. Textile Mill Saves 50%. John L. Perry. *Industry and Welding,* v. 22, May 1949, p. 60.

35,000 cast-iron rolls were adapted to take larger bobbins by use of machinable welds.

22B-183. Fixturized Soldering Insures Handle Bars. James H. King. *American Machinist,* v. 93, May 19, 1949, p. 94-95.

Fixtures and procedures for silver-soldering the above.

22B-184. Electrodes for Welding-on of Cutting Edges. (In Russian.) V. A. Lapidus. *Avtogennoe Delo* (Welding), Dec. 1948, p. 13-16.

Properties of two new electrodes which permit production of built-up tools whose stabilities are not surpassed by tools of forged, rapid-cutting steel of the same designation. Electrodes are fully recommended for industrial application.

22B-185. Variation of Stresses During Welding. (In Russian.) I. P. Trochun. *Avtogennoe Delo* (Welding), Dec. 1948, p. 22-23.

Stress variations in structural members as a result of heating and cooling during welding. Formation of residual stresses.

22B-186. Oxygen-Flux Cutting of High-Chromium Steel. (In Russian.) S. G. Guzov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 24-25.

Process and optimum conditions for different sizes of material.

22B-187. Character of Primary Crystallization of the Welding Bath. (In Russian.) A. M. Makara and B. I. Medovar. *Avtogennoe Delo* (Welding), Dec. 1948, p. 25-27.

Investigated particularly for steel billets and castings. It was concluded that the curve of crystallization in such cases has a jagged character due to the liberation of heat during formation of a nucleus of crystallization. Such crystallization may be represented by a wave function.

22B-188. A Survey of the Weldability of Plain-Carbon and Low-Alloy High-Tensile Steels. H. C. Skevington. *Sheet Metal Industries,* v. 26, May 1949, p. 1039-1048.

Definitions of weldability and factors influencing weldability. metallurgical changes at welded joints, influence of heating and cooling on

weld structure, effects of plate thickness, effect of multi-pass welding on varying thicknesses of plate, influence of base-metal composition on weldability, cracking in the heat-affected zone, weld-metal cracks, influence of sulfur on weldability, and weldability tests. 28 ref.

22B-189. A Welded Construction Drilling Jig. Robert Mawson. *Iron Age,* v. 163, May 19, 1949, p. 94-95.

Application to quick-change gear box, made of cast iron and used on a special type of machine.

22B-190. Resistance-Weld Failures Minimized by Test Method Applied to Diversified Joining Operations. *Steel,* v. 124, May 23, 1949, p. 90-93, 111, 113.

Details of quality-control system. Chart of standardized welding procedures is posted on each machine. A circular slide-rule-type device is used to convert angle of twist, torque, thickness, and weld-diameter data into shear strength and a "quality-control number". The application to several types of steel.

22B-191. Selecting Steel Arc-Welding Electrodes. *Machine Design,* v. 21, June 1949, p. 151-152.

Based on AWS-ASTM tentative joint specifications.

22B-192. A Survey of the Use of Welding in Structures. W. S. Atkins. *Welding,* v. 17, May 1949, p. 212-221.

22B-193. Welding on British Railways; Trackwork and Structures. N. W. Swinnerton. *Welding,* v. 17, May 1949, p. 222-228. A condensation.

22B-194. Welding Fixtures Speed Steel Cabinet Assembly. Walter Rudolph. *American Machinist,* v. 93, June 2, 1949, p. 96-97.

Teamwork and quick-acting fixtures combine with gas and gun welding to boost output.

22B-195. Flame Beveler Positioning. *Iron Age,* v. 163, June 9, 1949, p. 65.

Improved method which permits positioning of the beveling-machine frame rather than the tank for flame beveling tank plate preparatory to welding.

22B-196. Brazing in Salt Bath Furnaces. *Iron Age,* v. 163, June 9, 1949, p. 66-68.

Previously abstracted from *Metallurgia,* item 22A-90, 1949.

22B-197. Arc Welding a Housing Case for Hydraulic Drive. George Pheil. *Machine and Tool Blue Book,* v. 45, June 1949, p. 130-132.

22B-198. Arc Welded Design Used Advantageously on Farm Implements. *Steel,* v. 124, June 13, 1949, p. 101.

22B-199. Manual Submerged Arc Process Simplifies Welding for Many Uses. C. G. Herbruck. *Materials & Methods,* v. 29, June 1949, p. 64-66.

Hand method of submerged-arc welding as applied to irregular and otherwise inaccessible locations.

22B-200. Here's How Caterpillar Does It: Manufacturing Development. C. A. Matheny and W. J. Myers, *Industry and Welding,* v. 22, June 1949, p. 26-29, 64.

Organization and activities of Caterpillar Tractor Co.'s manufacturing development division. Some new welding designs developed.

22B-201. Are Your Shape Cutting Practices up to Date? F. B. Rykoskey. *Industry and Welding,* v. 22, June, 1949, p. 40-42, 44, 46, 65.

Equipment and procedures used by B. & O. R.R. shops. Of especial interest are the stack and flux-injection cutting operations.

22B-202. Scarfing in the Steel Mill. George Mersot. *Welding Engineer,* v. 34, June 1949, p. 20-22.

Procedure for flame-deseaming of blooms, billets, and slabs, commonly known as scarfing.

22B-203. Flash Welding African Rails. J. M. Lawless. *Welding Engineer,* v. 34, June 1949, p. 23.

Joining of three 40-ft. lengths into one 120-ft. rail at central depots.

22B-204. British Welded Railway Cars. Fred Brewster. *Welding Engineer,* v. 34, June 1949, p. 29.

London, Midland and Scottish Railway is using American production methods at its Derby plant. Large rotary jig rotates entire car to allow downhand welding.

22B-205. Bridge Flame-Straightened. Harriet Geithmann, *Welding Engineer,* v. 34, June 1949, p. 36-37.

Restoration of flood-battered bridge by flame-straightening and the welding torch.

22B-206. Pipe Production Line. *Welding Engineer,* v. 34, June 1949, p. 38-40.

Line at Maywood, Calif., said to be the first in the world to produce 30-in. diam. high-strength welded pipe on a commercial scale.

22B-207. Building-up a 2,000 Ton Breakdown. Richard Thuma. *Tool & Die Journal,* v. 15, June 1949, p. 46-47.

Fabrication of a platen for a 2000-ton hydraulic press from steel plate by forging and welding at Allis-Chalmers.

22B-208. New Factors to Be Considered in the Design and Welding of Ships. Milton Forman. *Journal of the American Society of Naval Engineers,* v. 61, May 1949, p. 494-505. Reprinted from

Welding Journal, v. 27, Sept. 1948, p. 671-678.

Previously abstracted from original, item 22b-279, 1948.

22B-209. Economies of Castings and Weldings. E. C. Moore. *Transactions of the Institute of Welding,* v. 12, Apr. 1949, p. 27-29.

Comparative labor and material costs of the two methods. Concludes that, for machine frames of 10-35 tons weight, welding is much more economical.

22B-210. Repairs to the All-Welded Tanker "Afghanistan". A. L. White. *Transactions of the Institute of Welding,* v. 12, Apr. 1949, p. 37-45.

Methods used.

22B-211. Welding in Shipbuilding, With Particular Reference to Passenger Liner Construction. L. Redshaw. *Welding Research,* v. 3 (bound with *Transactions of the Institute of Welding,* v. 12), Apr. 1949, p. 36r-46r.

Extensive information concerning specific details. Cost distribution, types of electrodes, percentage savings at five different stages in the progressive change-over from riveted to welded ships.

22B-212. Welding as a Means of Economising on Material and Labour in the Manufacture of Machinery Structures. F. Koenigsberger. *Welding Research,* v. 3 (bound with *Transactions of the Institute of Welding,* v. 12), Apr. 1949, p. 26r-35r.

Extended discussion.

22B-213. Uber eine Verbundschweissung. (Concerning a Compound Weld.) Fr. Bischof. *Schweissen und Schneiden,* v. 1, Feb. 1949, p. 26-28.

Methods and problems of welding steels with alkali-coated ferritic and austenitic electrodes and the danger of cracking at the transition zones and solid-solution boundaries by age-hardening caused by the formation of martensite. Welded samples were tested for hardness and metallographically examined.

22B-214. Einfluss der Oberflächenrauhigkeit und Passung beim Hartlöten. (The Effect of Surface Roughness and Fit in Hard Soldering.) Lothar Leinert. *Metalloberfläche,* v. 3, Mar. 1949, p. 62-67.

Results of experiments showing effects of above on joint strengths for various machine parts designed to be joined by hard soldering. 29 ref.

22B-215. Multiple Pass Automatic Welding of Thick Boiler Steels. (In Russian.) K. V. Lyubavskii and B. I. Lazarev. *Avtogennoe Delo* (Welding), Feb. 1949, p. 1-7.

Investigated for three different low-alloy steels (max. 0.15% C. 0.78% Si, 0.40% Mn, 0.029% S, 0.021% P, 0.50% Mo) using three different types of coated electrodes. Optimum conditions of operation and influence of individual factors, such as the form of the seam, compositions of electrode cores and coatings.

22B-216. Argon-Arc Welding of Thin Stainless Sheet Steel Without Use of Additional Metal. (In Russian.) A. G. Mazel. *Avtogennoe Delo* (Welding), Feb. 1949, p. 8-13.

Optimum conditions for butt welding 1.5-mm.-thick sheets of stainless steel without welding rods. Metallographic and X-ray investigations showed that the strength of a welded joint, on the average, is not less than that of the base material.

22B-217. (Book) **Welding Metallurgy: Iron and Steel.** Ed. 2. G. E. Linnert. 505 pages. 1949. American Welding Society, 33 W. 39th St., New York 18, N. Y.

This book is a revision of the one written by O. H. Henry and G. E. Claussen in 1940. Processes introduced during the past eight years such as inert-gas metal-arc welding, and more information on the metallurgy of specific materials such as the stainless, heat resisting, and stainless-clad steels. The fundamentals of metallurgy are discussed in the first chapters.

22B-218. Notes on the Weldability and Mechanical Properties of Manganese-Vanadium Plate Steel. Part I. T. W. Merrill. *Vancoram Review,* v. 6, no. 1, [1948], p. 7-9, 14-15.

Results of welding tests made on 1-in. plates. Two common methods of welding: the submerged-arc process and the manual, shielded-metal arc process. (To be continued.)

22B-219. Motor Car Production. 4. Assembly of the Morris Minor at the Birmingham Works of the Nuffield Organization. *Welding,* v. 17, June 1949, p. 232-241.

Metal-joining procedures and equipment used in production of above British car.

22B-220. Fabrication at B.T.H. (Continued.) T. Holme and H. H. Reeve. *Welding,* v. 17, June 1949, p. 252-259.

Weld fabrication of a wide range of heavy electrical equipment.

22B-221. Boiler Reconditioning; Some Developments of Butt Design. J. K. Johannesen. *Welding,* v. 17, June 1949,

Changes in butt-weld design.

p. 265-267.

22B-222. Welding Galvanized Pipe. H. E. Simkins. *Welding Journal,* v. 28, June 1949, p. 562.

Metallic-arc welding of a galvanized-iron exhaust stack approximately six stories in height and 36 in. in diam.

22B-223. How to Weld Sheet Steel. Part I. Oxy-Acetylene Welding. K. H. Koopman. *Welding Journal,* v. 28, June 1949, p. 563-566.

Method for making butt, flange, and corner welds in steel up to ⅛ in. thick.

22B-224. Fatigue of Welded and Riveted Trusses. C. Cerardini. *Welding Journal,* v. 28, June 1949, p. 241s-245s. Translated from *Journal de la Soudure,* v. 38, 1948, p. 199-203, 228-231.

Fatigue and static tests for comparing welded and riveted trusses. Design diagrams.

22B-225. Production Welding. *SAE Journal,* v. 57, June 1949, p. 25-27. Based on "Welding Applications in Automotive Construction" by John F. Randall.

Newly developed high-speed multiple-transformer resistance welders which have speeded welding of automotive assemblies at minimum cost.

22B-226. Life for Colombia's Dredges. G. B. Wood. *Mining World,* v. 11, June 1949, p. 37-40.

Reconditioning of dredge parts by use of Ni-Mn welding rod permits lower cost operation and prolongs life of bucket lines.

22B-227. How to Weld a Wheel. *American Machinist,* v. 93, June 16, 1949, p. 101.

Redesigning program developed by The Towner Mfg. Co.

22B-228. Werkstoff- und Spannungsfragen bei Entwurf und Herstellung geschweisster Bauteile und Bauwerke. (Problems of Material and Stress in the Design and Production of Welded Structural Parts and Structures.) Hans Melhardt. *Schweisstechnik,* v. 1, May 1947, p. 1-10.

A general discussion on the composition of materials and on welding methods, as they affect the strength properties of structural steel. Strength test and other data.

22B-229. Verschleissfeste Auftragschweissungen auf Stahl und Stahlguss. (Application of Wear-Resistant Deposits on Steel and Steel Castings by Welding.) W. Schnurer. *Schweisstechnik,* v. 1, May 1947, p. 10-11; June 1947, p. 6-7.

Repair of worn machine parts and increasing the life of new machine parts by deposition of hard materials on the parts subject to wear.

22B-230. Wärmetechnik und ihre Anwendung beim Schweissen von Stahlblech. (Heat Technique and Its Use in the Welding of Sheet Steel.) V. Trunschitz. *Schweisstechnik,* v. 1, Dec, 1947, p. 1-4.

Effect of heat (expansion, shrinkage, and warping) on the article to be welded. Methods of avoiding the undesirable effects of heat. (To be continued.)

22B-231. Spot Weld Assembly Improves Cabinets at Lyon Metal Products. *Modern Industrial Press,* v. 11, June 1949, p. 48, 50.

Use of resistance welding in place of nuts, bolts, and rivets to improve quality and reduce costs. Production procedure and advantages.

22B-232. Oxy-Acetylene Flames Help Make Coal Loaders. Harry Vogelpohl. *Mechanization,* v. 13, June 1949, p. 108-109.

How flame cutting minimizes machining in the production of mechanical coal-loading machines.

22B-233. Continuous Salt Bath Furnace for Brazing Chairs. *Machinery* (London), v. 74, June 9, 1949, p. 764-765.

22B-234. Welded Bridges in New South Wales, Australia. V. Karmalsky. *Engineering,* v. 167, June 10, 1949, p. 529-532. A condensation.

Their construction. (One of the prize-winning papers in recent J. F. Lincoln Arc-Welding Foundation contest.)

22B-235. Welding Compressor Shells. *Iron Age,* v. 163, June 23, 1949, p. 65, 70.

Procedures and equipment used by Westinghouse Electric Corp., East Springfield, Mass., for assembly of refrigerator compressor shells from SAE 1010 deep-drawing stock.

22B-236. Gas-Shielded Arc Welds Stainless Cups. Clarence Root. *American Machinist,* v. 93, June 30, 1949, p. 94-95.

Mechanized setups which produce straight and circular joints that require a minimum of polishing on 14-gage steel. For milking-machine cups.

22B-237. Lustron's Spot-Welded Homes. Clyde B. Clason. *Welding Engineer,* v. 34, July 1949, p. 17-23.

Fabrication processes, with emphasis on welding procedures; plant and personnel; features of the home.

22B-238. New Shoes Not Needed. Howard C. Close and E. J. St. Eve. *Welding Engineer,* v. 34, July 1949, p. 28-29.

Overlaid roller-bearing shoes adopted by the Missouri Pacific Railroad Co. Deposit is an Al-Fe-Cu

alloy having high hardness and tensile strength combined with wear and corrosion resistance. Results are much more satisfactory than with the previous use of an Al bronze overlay tack welded to the cast-steel shoe. Welding procedure.

22B-239. Heavy Cutting. L. P. Elly. *Welding Engineer,* v. 34, July 1949, p. 34-38, 40.

Uses in a steel mill, installation requirements, cutting stations, torches and operations, the oxygen lance, shape cutting a 30-in. block and cranks 28 in. thick, and precision cutting.

22B-240. Weldment Replaces Cast Cylinder. Ray Bloomberg. *Welding Engineer,* v. 34, July 1949, p. 42, 44.

Describes fabrication of a first intermediate-pressure cylinder from welded plate for the SS Edward Chambers.

22B-241. Arc Welding Plus Imagination Halves Maintenance Costs. J. B. Cotter. *Power,* v. 93, July 1949, p. 81-83.

How arc welding converted an old economizer into a modern unit at half the replacement cost.

22B-242. Tube Welding Processes and Machinery Contribute to 10-Fold Production Increase. *Steel,* **v. 125, July 11, 1949, p. 120.**

Processes and plants of the Michigan Steel Tube Products Co.

22B-243. Aluminum Welding Fixture Is Easy to Handle. W. S. Hansen. *American Machinist,* v. 93, July 14, 1949, p. 98.

Fixture used for assembling Alemite lubrication units for the automotive service industry by arc or spot welding.

22B-244. Big Scoop (Welded of Course). *Industry and Welding,* v. 22, July 1949, p. 26-29, 74-76.

Special emhpasis is given to joint design, selection of proper type electrodes, and welding procedures in construction of 45-cu. yd. power-shovel dipper.

22B-245. What's Wrong With Welding Codes? Part II. (Concluded.) L. K. Stringham. *Industry and Welding,* v. 22, July 1949, p. 30-32, 34, 36.

Shows how sound welds often fail and unsound welds pass the guided bend test. Maintains that many good welders are disqualified unfairly and suggests specific revision of the existing code requirements.

22B-246. Tips on Hardsurfacing. II. M. Riddihough. *Industry and Welding,* v. 22, July 1949, p. 48-49, 51, 62-64.

Practical information on design of the weld deposit. Specific examples are digger teeth, hammers, conveyors, and hot and cold shear blades.

22B-247. Longest Tunnel Gets Welded Rail. *Railway Engineering and Maintenance,* v. 45, July 1949, p. 667-669.

Great Northern project. How the rail is being welded, tested to detect flaws, coated with a preservative, and laid.

22B-248. Susceptibility to Welding Cracking, Welding Sensitivity, Susceptibility to Welding Seam Cracking, and Test Methods for These Failures. K. L. Zeyen. *National Advisory Committee for Aeronautics,* Technical Memorandum 1249, June 1949, 35 pages.

Methods used in Germany just prior to the Second World War for determining susceptibility to weld cracking and to weld-seam cracking of steel. No satisfactory method was found for determining welding sensitivity. 31 ref.

22B-249. Bolzenschweissung mit Hilfe des elektrischen Lichbogens ohne Materialzusatz; Le soudage de goujons a l'arc electrique sans matiere d'apport. (Electric Arc Stud Welding Without the Deposition of Materials.) Hugo Hess. (In both German and French.) *Zeitschrift fur Schweisstechnik; Journal de la Soudure,* v. 39, June 1949, p. 100-107.

Method and apparatus.

22B-250. Beitrag zur Hartlötung von Baustahl mit Kupfer-Phosphorlot. (Hard Soldering of Structural Steel With Copper-Phosphorus Solder.) Friedrich Erdmann-Jesnitzer. *Metall,* v. 3, June 1949, p. 186-187.

Experiments on the hard soldering of carbon steel using a 6% P copper wire. Photomicrographs show joint structures.

22B-251. Pressure Welding Speeds Production of Tractor Parts. *Product Engineering,* v. 20, July 1949, p. 103.

The above plus change in type of steel resulted in faster production and lower cost on front-idler and track-roller shafts.

22B-252. High Production of Small Compressors. Part I. Paul M. Giles. *Industry and Welding,* v. 22, July 1949, p. 40-42, 46.

A combination of the three major welding methods, together with efficient handling practices, increases production of compressors for household refrigerators.

22B-253. Soo Line Builds All-Welded Gondolas. L. R. Vassick. *Railway Mechanical Engineer,* v. 123, July 1949, p. 384-389.

Procedure and equipment for building cars.

22B-254. Some Thoughts on Improving Flame Cutting Operations. Part I. *Machine and Tool Blue Book,* v. 45, July 1949, p. 109-115.

Some hints on technique. (To be continued.)

22B-255. Multiple Head Four-Point Projection Welder. *Machinery Lloyd* (Overseas Edition), v. 21, June 18, 1949, p. 100.

A special multiple projection welder recently designed for welding hat-shaped clips on surface panels of doors of electric ranges.

22B-256. Investigation of the Electrical Properties of Argon-Shielded Welding Arcs. (In Russian.) A. Ya. Brodskii and G. M. Tikhodeev. *Avtogennoe Delo* (Welding), Mar. 1949, p. 1-3.

The arcs produced between tungsten and Cr-Ni steel were investigated. Influence of additions to the argon on arc voltage was established, as well as other factors.

22B-257. Type MEZ-04 Electrodes for Welding Low-Carbon Steels. (In Russian.) N. N. Kryukovskii. *Avtogennoe Delo* (Welding), Mar. 1949, p. 9-11.

Chemical composition of above electrodes and their coatings and mechanical properties of the welds.

22B-258. The Welding of High-Pressure Air-Vessel Assemblies; Metallurgical and Mechanical Considerations. K. G. Lewis, *Metallurgia,* v. 40, June 1949, p. 77-87.

Materials and methods of assembly, with special reference to the austenitic welding of low-alloy steels. The pulsation form of pressure test and results for a series of air-vessel assemblies. It is concluded that low-alloy-steel vessel bodies are satisfactorily sealed by austenitic welding, the resultant unit being definitely superior to a screwed and sweated assembly. 25 ref.

22B-259. Production of the Land-Rover. *Machinery* (London), v. 74, June 30, 1949, p. 871-879.

Production of British multi-purpose vehicle developed to meet the demands of agriculture and industry. Emphasizes welding and assembly operations.

22B-260. Arc Welding in Sweden. K. A. Ringdahl and L. A. Lidstone. *Welding,* v. 17, July 1949, p. 278-289.

Said to be the first authoritative account to be published in Britain of arc welding in Sweden.

22B-261. Welded Factory for Wool Industry. *Welding,* v. 17, July 1949, p. 290-293.

Unusual steel-framework design for British mill.

22B-262. Motor Car Production. 5. Arc Welding on the Chassis of the "Vanguard". J. W. Slack. *Welding,* v. 17, July 1949, p. 294-299.

As applied to British automobile.

22B-263. Fabrication at B.T.H. T. Holme and H. H. Reeve. *Welding,* v. 17, July 1949, p. 300-308.

Third part of a survey dealing with activities of above factory at Rugby, England, deals with methods for testing welded products, control of welders, and maintenance work. Products consist largely of heavy steel equipment.

22B-264. Cam Life Increased 1200%. *Welding Journal,* v. 28, July 1949, p. 672.

How Al-bronze welding rod was used to repair a cold nut blanker.

22B-265. Make Tough Jobs Easy. H. B. Gilson. *Welding Journal,* v. 28, July 1949, p. 673-674.

Three key steps for producing strong bronze welds in repair work.

22B-266. New Technique for Welding Chrome Pipe Disclosed. *Welding Journal,* v. 28, July 1949, p. 674.

According to the new method for 4-6 Cr-steel pipe a large preheating tip with oxy-acetylene is used first to bring the temperature of the joint up to 600-800° and keep it there while being welded with a chromium electrode (A.S.T.M.-A.W.S. Spec. No. E-502). After this, the temperature is raised to 1200-1350° and the joint wrapped with asbestos tape to a minimum thickness of 1 in. and cooled to room temperature. Contrary to popular belief this technique does not make the weld metal brittle. Mechanical tests gave very desirable results.

22B-267. Weldability of Low-Alloy High-Tensile Steel. George G. Luther, Carl E. Hartbower, and Donald B. Roach. *Welding Journal,* v. 28, July 1949, p. 289s-309s.

Effects of Ti and V on the mechanical properties and weldability of an experimental low-alloy high-tensile steel. Small variations in amounts of these elements produced a marked effect on the transition temperature.

22B-268. The Weldability of Carbon-Manganese Steels. R. D. Williams, D. B. Roach, D. C. Martin, and C. B. Voldrich. *Welding Journal,* v. 28, July 1949, p. 311s-325s.

Usefulness of the notched-bead slow-bend test for measuring the weldability of steels and the influence of C and Mn in weldability. Deals with specific points leaving over-all conclusions to the summary report by Voldrich and Harder. (See following abstract.)

22B-269. Review on the Weldability of Carbon-Manganese Steels. C. B. Voldrich and O. E. Harder. *Welding Journal*, v. 28, July 1949, p. 326s-336s.

Reviews 8-yr. program of research. Investigations have evaluated the influence of C and Mn on the weldability of the carbon-manganese steels and the usefulness of a notched-bead bend test for evaluating weldability. Discusses important factors involved under the headings: steel (base metal) factors; welding technique; design; and service-condition.

22B-270. Tubing Produced by Welding Coiled Strip. *Iron Age*, v. 164, July 28, 1949, p. 47.

Method developed consisting of mechanized, inert-gas-shielded arc welding.

22B-271. Welding Saves Press Casting. *Iron Age*, v. 164, July 28, 1949, p. 58.

Repair of a large felt press casting by welding.

22B-272. Protection des surfaces intérieures des appareils de raffinerie. (Protection of Internal Surfaces in Refineries.) H. Mayslich. *Soudure et Techniques Connexes*, v. 3, Mar.-Apr. 1949, p. 52-68.

Modern methods, with particular emphasis on deposition of corrosion-resistant metal on new and used apparatus by means of arc or gas welding. Methods and optimum conditions for such welding. Possibility of protection by means of rubber and other plastic acid-resistant materials.

22B-273. Determination of Microstructure of Stainless-Steel Weld Seams on the Basis of Microhardness. (In Russian.) B. I. Medovar and A. E. Asnis. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 15, May 1949, p. 570-571.

It was found that the presence of carbides increases the tendency of the weld metal toward intercrystalline corrosion and sharply decreases its plasticity. Chromium carbides may be differentiated from the ferrite component by microhardness determination. Therefore, this technique is recommended for more complete characterization of the quality of the weld.

22B-274. Welding as an Aid to Steel Economy. *Transactions of the Institute of Welding*, v. 12, June 1949, p. 47-51.

Proceedings of conference held in Britain, March 22-25, 1949.

22B-275. Survey of the Use of Welding in Structures. W. S. Atkins. *Transactions of the Institute of Welding*, v. 12, June 1949, p. 59-63.

Main advantages over riveted or bolted construction.

22B-276. Survey of the Use of Welding in Structures. S. M. Reisser. *Transactions of the Institute of Welding*, v. 12, June 1949, p. 64-69.

Second of two papers on above subject. Draws a clear distinction between the two main types of welded structures. Main principles of design and detailing, and influence of works equipment and organization on the cost of fabrication and erection.

22B-277. The Economic Construction of Moderate Sized All-Welded Ships. H. H. Hagan. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), June 1949, p. 50r-51r.

Principally with reference to shipyard layout and personnel problems.

22B-278. Welding as Applied to Railways and Rolling Stock. B. R. Byrne. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), June 1949, p. 52r-59r.

A variety of above application, showing savings made possible by substitution of welding for other forms of construction.

22B-279. Welding on British Railways —Trackwork and Structures. N. W. Swinnerton. *Welding Research*, v. 3 (bound with *Transactions of the Institute of Welding*, v. 12), June 1949, p. 60r-66r.

Savings possible by substitution of welding for other methods.

22B-280. Welding as an Aid to the Saving of Steel and Manpower in Railway Workshops. G. Foster. *Welding Research*, v. 3, (bound with *Transactions of the Institute of Welding*, v. 12), June 1949, p. 67r-72r.

22B-281. The Effect of Various Fasteners on the Fatigue Strength of a Structural Joint. K. H. Lenzen. *American Railway Engineering Association Bulletin*, v. 51, June-July 1949, p. 1-28.

Three groups of structural joints, identical except for the fasteners, were subjected to fully reversed cycles of fatigue loading. The selected fasteners were hot-driven rivets, cold-driven rivets, and bolts. A group of static tests and a group of fatigue tests on the typical joints. 10 ref.

22B-282. About One of the Largest Thermit Welding Jobs Ever Performed on the Pacific Coast. *Victor Weld*, July 1949, p. 4-5.

A thermit weld on a fractured freighter skeg.

22B-283. Heavy Cutting in the Steel Mill. L. P. Elly. *Welding Journal*, v. 28, Aug. 1949, p. 721-727.

22B-284. Welding Metallurgy—Iron and Steel. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal,* v. 28, July 1949, p. 642-645; Aug. 1949, p. 731-740.

Begins serial publication of revised edition of above book originally published in 1940. July installment consists of the introductions to the first and second editions and Chapter 1, "Metallurgy of Welding". Aug. issue presents Chapter 2: "Types of Steel and Their Manufacture". Various forms of steelmaking furnaces and the respective processes, also the properties and applications of different steels.

22B-285. Oxyacetylene Flame Shape Cutting in Railroad Shops. F. B. Rykoskey. *Welding Journal,* v. 28, Aug. 1949, p. 749-755.

22B-286. Should the Guided-Bend Test Be Modified? L. K. Stringham. *Welding Journal,* v. 28, Aug. 1949, p. 755-758.

Previously abstracted from *Industry and Welding,* items 22A-125 and 22B-245, 1949.

22B-287. Rigid-Frame Harbor Shed. G. L. Revell. *Welding Journal,* v. 28, Aug. 1949, p. 759-763.

World's largest unobstructed single-span harbor shed realized full advantages of welded rigid-frame construction. Over-all structure and details of construction.

22B-288. Arc Welding in the Mower Industry. John A. Perry and C. A. McClean. *Welding Journal,* v. 28, Aug. 1949, p. 764-766.

22B-289. Diesel Cylinder Head Repair. J. W. Kenefic and R. E. Barber. *Welding Journal,* v. 28, Aug. 1949, p. 766.

Use of gas welding for repair of cast-iron heads by a large railroad in the Northwest.

22B-290. How to Weld Pipe. F. C. Geibig. *Welding Journal,* v. 28, Aug. 1949, p. 767-772.

Helpful hints for steel pipe.

22B-291. Butt-Welding Structural I-Beams. F. Lang. *Welding Journal,* v. 28, Aug. 1949, p. 774-775.

The importance of proper welding sequence, and a method of estimating contraction.

22B-292. Welding Rails on Ship Model Towing Basin. W. J. Leonard. *Welding Journal,* v. 28, Aug. 1949, p. 365s-372s.

Procedures for welding 165 and 180-lb. rails which avoid undesirable metallurgical changes. Alignment requirements favor the butt joint.

22B-293. Metallurgical Aspects of Welding Mild Steel. Nils Christensen. *Welding Journal,* v. 28, Aug. 1949, p. 373s-380s.

Factors governing the selection of electrode coatings from the fundamental point of view. 24 ref.

22B-294. How Ship Failures Affect You. E. Paul DeGarmo. *Welding Engineer,* v. 34, Aug. 1949, p. 17-20.

The relationship between failures of welded ships and prevention of failures in other welded structures. Residual stresses, preheat vs. postheat, and design.

22B-295. Australian Rail-Welding Process. Herbert Leopold. *Welding Engineer,* v. 34, Aug. 1949, p. 21, 24.

A modified thermit-welding process developed by an Australian inventor.

22B-296. River Crossings for Pipe Lines. Elton Sterrett. *Welding Engineer,* v. 34, Aug. 1949, p. 22-24.

Welding problems. Pipe lines are often divided in three so that damage to one branch will not stop the flow.

22B-297. Shattered Flywheel Restored to Service. Rene D. Wasserman. *Welding Engineer,* v. 34, Aug. 1949, p. 34-35.

New processes of arc cutting and low-heat cast-iron welding which made it possible to repair the two-ton flywheel of a rock crusher.

22B-298. Tanks to Push up Windows. *Welding Engineer,* v. 34, Aug. 1949, p. 36-37.

Seam welding of steel vacuum tanks used in connection with the automatic operation of auto windows.

22B-299. Some Thoughts on Improving Flame Cutting Operations. Part 2. *Machine and Tool Blue Book,* v. 45, Aug. 1949, p. 107 108, 110, 112, 114, 116.

This part, in addition to a discussion of lags and kerfs, includes sections on bevel cuts and circle cuts.

22B-300. Here's How Midwest Welds Pipe and Fittings. Phil R. Becker. *Industry and Welding,* v. 22, Aug. 1949, p. 22-24, 26-27, 29, 69-71.

A modern method of fabricating pipe and fittings for a variety of industrial applications. Preparation, setup, and welding procedures.

22B-301. "Canned" Aircraft Engines—A Welding Pictorial. *Industry and Welding,* v. 22, Aug. 1949, p. 36-39.

Fabrication of two types of pressurized steel shipping containers for storing and shipping airplane engines.

22B-302. Tips on Hardsurfacing. M. Riddihough. *Industry and Welding,* v. 22, Aug. 1949, p. 40, 42-46.

Differences between metallic-arc and oxy-acetylene deposition of hard facing materials. Techniques

for fusion welding and braze welding.

22B-303. Welding Makes Lower Cost Shells. *American Machinist,* v. 93, Aug. 11, 1949, p. 120.

Application to 2½-gal., stainless-steel, fire extinguisher.

22B-304. All-Welded Steel Barge Construction. *Engineer,* v. 188, July 22, 1949, p. 101-102.

At a British plant.

22B-305. Farm Equipment Manufacturing Methods and Costs Improved by Resistance Welding. *Steel,* v. 125, Aug. 15, 1949, p. 97-100; Aug. 22, 1949, p. 64-67.

22B-306. Cranes and Excavators. *Welding,* v. 17, Aug. 1949, p. 334-340.

Weld fabrication.

22B-307. Welding Manipulators. G. W. McArd. *Welding,* v. 17, Aug. 1949, p. 341-346.

Design and operation of three different types of special-purpose manipulators used in construction of heavy equipment.

22B-308. Tank Wagon Repairs. J. K. Johannesen. *Welding,* v. 17, Aug. 1949, p. 356-358.

Practical details of methods and techniques for welding damaged tank trucks.

22B-309. Elevator Welding Positioner Doubles Production. *Steel,* v. 125, Aug. 29, 1949, p. 86.

Welding a gland ring at top and bottom to a steel pump liner shell without removing it and without changing the level of the Unionmelt welding head.

22B-310. Prefabricated Construction of Welded Steel Barges. *Engineering,* v. 168, July 29, 1949, p. 104-105.

At a British yard.

22B-311. An Investigation Into the Factors Affecting the Adhesion of Vitreous Enamel to Arc Welded Mild Steel. E. Bishop. *Sheet Metal Industries,* v. 26, Aug. 1949, p. 1755-1760.

Experiments made to determine causes of enamel defects on welded, thin-gage, mild steel sheet, and to determine welding techniques which would facilitate satisfactory enameling. The cause of blistering was found to be the evolution of atomic or molecular hydrogen, or water vapor. Methods of removal by heating and by the use of a special electrode. The welding of very thin mild steel sheet for enameling by use of a solid copper backing bar.

22B-312. Cyclic Heating Test of Main Steam Piping Joints Between Ferritic and Austenitic Steels—Sewaren Generating Station. H. Weisberg. *Transactions of the American Society of Mechanical Engineers,* v. 71, Aug. 1949, p. 643-649; discussion, p. 649-664.

It is concluded that sound welded joints can be made between these dissimilar materials and that such joints will withstand the effects of temperature changes which may be expected to occur in modern power-plant service.

22B-313. Burn-Off Characteristics of Steel Welding Electrodes. D. C. Martin, P. J. Rieppel, and C. B. Voldrich. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 33-43; discussion, p. 44-45.

See abstract of *American Iron and Steel Institute,* Preprint, 1949, item 22B-172, 1949.

22B-314. Some Practical Spot Welding Comparisons: Single-Phase Vs. Three-Phase Converter. F. L. Brandt, L. S. Wilkins, and R. T. Vredenburgh, Jr. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 104-106.

Experimental results for spot welding of ⅛ or $\frac{3}{16}$-in. hot rolled steel.

22B-315. Freight Cars From California. *Western Machinery and Steel World,* v. 40, Aug. 1949, p. 62-65.

Weld, flame cutting, and pressing procedure for fabricating freight cars.

22B-316. Flash Welding of Wide Strip Steel. F. R. Thompson and F. J. Waldschutz. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 35-39; discussion, p. 39-40.

Welding of wide strip for cold rolling has met with many difficulties. The flash welder described, combined with proper procedure, should eliminate many of these problems.

22B-317. Projection Welding Speeds Gas Ranges. Gerald Eldridge Stedman. *Welding Engineer,* v. 24, Sept. 1949, p. 17-19.

Production of cooking ranges features multiple welder with four transformers able to make 48 projection welds on the oven assembly in 5 sec.

22B-318. Apex Prefabricates Structural Steel. Fred M. Burt. *Welding Engineer,* v. 24, Sept. 1949, p. 20-23, 44.

Procedures, equipment, and products of Apex Steel Corp., Los Angeles.

22B-319. "Squirt Gun" Welding of Huge Pipes. H. Jackson. *Welding Engineer,* v. 24, Sept. 1949, p. 24-25.

"Squirt-gun" welding is the semi-automatic submerged-arc process. It offers many advantages for fabrication of pipe up to 10 ft. in diameter.

22B-320. Tanker Gets New Midsection. Margaret Ralston. *Welding Engineer,* v. 24, Sept. 1949, p. 28.

How a tanker was lengthened 30 ft. for civilian service by cutting it in two with torches and then welding into place a new midsection.

22B-321. Carbon Arc Welds Cast-Iron Press. William C. Henzlik. *Welding Engineer*, v. 24, Sept. 1949, p. 32-33.

Instead of the conventional oxy-acetylene method, the carbon arc was used to rejoin broken brackets to the cast-iron frame of a toggle drawing press. Important changes in procedure.

22B-322. Gas-Welded Water Main. Herbert Leopold. *Welding Engineer,* v. 24, Sept. 1949, p. 34-35.

Welding of 223-mile aboveground main used to supply an Australian desert town with water.

22B-323. Cost Savers for Pipe Line. R. G. Swisher. *Welding Engineer,* v. 24, Sept. 1949, p. 36-37.

How welded devices reduced cost and sped work in construction of a 24-in., 7½-mile gas main. Portable steel bridges were used to carry vehicular traffic over trenches. A welded crane positioned the pipe.

22B-324. Tips on Tip Care. D. S. Jones. *Welding Engineer,* v. 24, Sept. 1949, p. 38-40.

Practical recommendations for the flame-cutting operator.

22B-325. Improved "Putting-On" Tool. E. F. Davis. *Welding Engineer,* v. 24, Sept. 1949, p. 42.

Low-hydrogen-type electrodes, AWS E-6015, offer excellent possibilities when undersized parts have to be built up and then have threads turned on the deposited material.

22B-326. Spot Welding Stainless Steel (AWS Recommended Practice). *Welding Engineer,* v. 24, Sept. 1949, p. 49. Condensed from American Welding Society, Standard C1.1-46T.

22B-327. Arc-Welded Beam and Column Framing. Ned L. Ashton. *Progressive Architecture,* v. 30, Sept. 1949, p. 86-89.

Design details.

22B-328. Fatigue Strength of Fillet-Weld, Plug-Weld, and Slot-Weld Joints Connecting Steel Structural Members. Wilbur M. Wilson, William H. Munse, and Walter H. Bruckner. *Engineering Experiment Station, University of Illinois,* Bulletin Series No. 380 (Bulletin, v. 46, no. 68), May 1949, 104 pages.

Extension of work described in *University of Illinois Engineering Experiment Station,* Bulletin 350. Some specimens were designed to fail in the weld, others to fail in the plates or channels themselves. Some fillet-weld joints were single-pass welds; others were triple-pass welds.

22B-329. Certain Problems in the Metallurgy of Automatic Welding of Type EYa-1T Steel Under Flux. (In Russian.) K. V. Lynbavskii. *Avtogennoe Delo* (Welding), Apr. 1949, p. 1-7.

Steel is an 18-8 Cr-Ni austenitic type containing Ti. It was found that fluxes with a ratio of total basis oxides to total acids of about 1.2-1.35 and having additions reducing their viscosity in the molten state (CaF_2 and TiO_2) possess completely satisfactory metallurgical properties. Attempts to use high-Ti fluxes did not result in marked improvement.

22B-330. Automatic Welding of Type EYa-1T Stainless Steel. (In Russian.) I. N. Gerasimenko and E. M. Lapitskaya. *Avtogennoe Delo* (Welding), Apr. 1949, p. 7-9.

The type of flux and electrode composition most suitable for 18-8 Cr-Ni steel (containing Ti) was investigated. The presence of at least 1.3% Cb in the electrode composition guarantees sufficient resistance of the weld metal to intercrystalline corrosion.

22B-331. Investigation of Single-Pass Automatic Butt Welding of Type SXL2 Steel Under Flux. (In Russian.) A. V. Obukhov and M. M. Kraichik. *Avtogennoe Delo* (Welding), Apr. 1949, p. 9-15.

Steel contains 0.16% C, 0.63% Mn, 0.35% Si, 0.72% Cr, 0.47% Ni, 0.45% Cu, 0.05% Mo, 0.003% S, and 0.02% F. Mechanical properties of welds obtained by above method were tested in bending, under Izod notch impact, and to rupture. Beneficial effect of annealing after welding and optimum conditions for this treatment.

22B-332. Influence of Electrical Characteristics of Contact Welding Machines on Stability of the Welding Process. (In Russian.) D. S. Balkovets. *Avtogennoe Delo* (Welding), Apr. 1949, p. 15-17.

Results of theoretical and experimental investigation indicate the relationships of stability to electrical characteristics. Methods of improving stability.

22B-333. Erfahrungen mit dem geschweissten und nicht nachgeglühten Lokomotiv-Kessel; seine Berechnung und Herstellung. (Experiences with Welded and Not Subsequently Annealed Locomotive Boilers: Their Design and Production.) R. Kühnel. *Schweissen und Schneiden,* v. 1, May 1949, p. 71-78.

Successes and failures of fillet and butt welding of locomotive boilers and their components. Optimum steel compositions.

22B-334. How To Silver Braze and Solder Stainless Steel. Lester F. Spencer. *Iron Age,* v. 164, Sept. 15, 1949, p. 69-74.

Alloys, standard specifications, fluxes and joint design, as well as part cleaning and joining techniques, for various types of stainless steels.

22B-335. Gaseous Fluxes for Brazing Steel. Alden P. Edson, Donald G. Paquette, and I. Laird Newell. *Journal of Metals* (News Section), v. 1, Sept. 1949, p. 25-27.

Boron trifluoride is particularly attractive. Wetting and flow of molten brazing alloys are excellent, the quality of the brazed joint is exceptional, and there is no evidence of attack on the steel surface.

22B-336. Pressure Vessel Production. *Welding,* v. 17, Sept. 1949, p. 377-387.

British plant for production of welded pressure vessels.

22B-337. Automatic Welding for Carriage Construction. Report No. 1: The Pullman-Standard Works. *Welding,* v. 17, Sept. 1949, p. 409-420.

22B-338. Operating Characteristics of Arc Welding Electrodes. F. W. Myers, Jr. *Steel,* v. 125, Sept. 19, 1949, p. 78-82, 84.

Tests on welding of steel with various types of electrodes. Weld-penetration characteristics indicate that the previously accepted theory of weld-metal penetration and depth of heat-affected zone increasing and decreasing together is basically incorrect.

22B-339. Box Beams Produced Economically by Welding. *Steel,* v. 125, Sept. 19, 1949, p. 101.

22B-340. Riveted Vs. Welded Ship Structure. E. M. MacCutcheon. *Journal of the American Society of Naval Engineers,* v. 61, Aug. 1949, p. 719-728; discussion, p. 728-736.

Previously abstracted from *Welding Journal.* See item 22B-69, 1949.

22B-341. Resistance Welding of Jet Engines. H. E. Lardge. *Journal of the American Society of Naval Engineers,* v. 61, Aug. 1949, p. 749-756.

Previously abstracted from *Welding Journal.* See item 22B-95, 1949.

22B-342. Welded Deck Girder Highway Bridge. Ned L. Ashton. *Welding Journal,* v. 28, Sept. 1949, p. 832-840.

Design and construction, which results in considerable savings.

22B-343. Double-Headed Fixture Welds Both Ends of Tank at Same Time. *Welding Journal,* v. 28, Sept. 1949, p. 840.

22B-344. Resistance Welding Stainless Steel Truck-Trailer Body Components. Byron Gates. *Welding Journal,* v. 28, Sept. 1949, p. 841-846.

Fabrication of roof, sides, floor, underframes, and doors. Assemblies are shipped in sets.

22B-345. Economic Electric Arc Welding. S. Oestreicher. *Welding Journal,* v. 28, Sept. 1949, p. 848-851.

Choice of suitable welding machines, electrodes, placement of apparatus and controls. Method of recording actual welding time.

22B-346. Welding Produces Forming Dies From Scrap Axles. *Welding Journal,* v. 28, Sept. 1949, p. 871-872.

Conversion of locomotive axles into large press dies for forming car parts at Union Pacific Omaha shops by means of forging hammer, flame cutting, and automatic submerged-arc welding.

22B-347. Welded Repair of a 52-Ton Cast Steel Press Base. Leslie C. Haynes and J. F. Sloan. *Welding Journal,* v. 28, Sept. 1949, p. 872-873.

22B-348. Arc-Welded Beam and Column Framing. *Welding Journal,* v. 28, Sept. 1949, p. 874-875.

Procedures for all-welded steel-frame building construction; design details.

22B-349. Spot Welding Galvanized Steel. M. L. Begeman, M. L. Hipple, and L. Cullum, Jr. *Welding Journal,* v. 28, Sept. 1949, p. 385s-395s.

Effect of welding current, timing, and pressure. Physical and metallurgical investigations as well as results of the use of a refrigerated coolant in electrodes. 17 ref.

22B-350. Welding in Locomotive Construction and Repair. F. Hargreaves. *Transactions of the Institute of Welding,* v. 12, Aug. 1949, p. 98-104.

Methods used by a British concern. Heat treatment after welding. Pioneer work on stereoscopic radiographs of welds.

22B-351. Induction Brazing Methods Applied to Permanent Magnets. D. Hadfield. *Metallurgia,* v. 40, July 1949, p. 165-166.

Difficulties previously encountered in the fabrication of permanent magnets, involving the use of the newer magnet materials, have been overcome by using the methods described. The process has made the high-energy anisotropic alloys suitable for a wide range of instrument uses.

22B-352. Submerged Melt Welding Stainless Clad. *Iron Age,* v. 164, Sept. 29, 1949, p. 69.

Bonding of stainless to carbon steel with automatic hidden-arc welding. Speed of welding is increased 11-15 in. per min.

22B-353. Problems of Welded Ship Design. J. F. Baker and F. B. Bull. *Engi-*

neers' Digest, v. 10, Aug. 1949, p. 267-270.

A general discussion.

22B-354. Hard-Facing Improves Performance and Reduces Maintenance Costs of Ball Mill Shearing Machine Parts. Part III. *Steel,* v. 125, Oct. 3, 1949, p. 82.

Use of Stellite alloy.

22B-355. Large Welded Pipe Manufactured on New Low-Cost Equipment. *Steel,* v. 125, Oct. 3, 1949, p. 97.

Hydraulic press-forming and submerged arc welding steel plate into pipe now can be accomplished on a complete mill recently engineered and built by Yoder Co.

22B-356. Sprodbruchgefahr und Werkstoffprufung bei geschweissten Konstruktionen. (Testing of Materials and Tendency Towards Brittle Fracture in Welded Construction.) Erich Folkhard. *Schweisstechnik,* v. 3, June 1949, p. 61-66.

Causes of brittle fractures, means of avoiding them, and methods for eliminating unsuitable materials. (To be continued.)

22B-357. Zur Frage der Qualitätsüberwachung von Schweissungen; Le contrôle de la qualité des soudures. (Controlling the Quality of Welds.) W. Felix. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 39, Aug. 1949, p. 139-149; Sept. 1949, p. 167-175.

Extensive discussion on the basis of published information. Refers only to ferrous welded structures. Design factors. (To be continued.)

22B-358. Seam Welding Stainless Steel. *Welding Engineer,* v. 34, Oct. 1949, p. 65.

Data sheet of A.W.S. recommended practice.

22B-359. Projection Welding. R. K. Waldvogel. *Metal Progress,* v. 56, Oct. 1949, p. 510.

Joining cost decreased 80% in manufacture of small pressure vessels.

22B-360. Embossed Projections for Resistance Welding. *American Machinist,* v. 93, Oct. 6, 1949, p. 147.

Data sheet for selecting the proper contour and size of the above to be used for low-carbon steel.

22B-361. Doubled Production. *Industry and Welding,* v. 22, Oct. 1949, p. 38, 62-63.

Automatic weld fixture, consisting of a standard welding positioner mounted on an air piston which was designed and built at Gardner Denver Co. for fabricating steel pump liners.

22B-362. Welded 8½% Ni Steel for −300° F. Saves 50%. A. Grodner. *Industry and Welding,* v. 22, Oct. 1949, p. 40-42, 44, 64.

Design of pressure vessels for use at low temperatures and under pressure. Testing and welding procedure.

22B-363. Using Oxy-Acetylene for Straightening, Forming, and Cleaning Structural Steel. F. H. Dill. *Iron and Steel Engineer,* v. 26, Sept. 1949, p. 82-84.

Use to remove undesired distortion due to welding and to introduce desired distortion in steel parts.

22B-364. Automatic Submerged Arc Welding Increases Efficiency. F. W. Zilm. *Oil and Gas Journal,* v. 48, Oct. 6, 1949, p. 297, 299.

Equipment and applications. New developments and tests under consideration.

22B-365. How Metalizing Cuts Costs. John E. Wakefield. *Coal Age,* v. 54, Oct. 1949, p. 86-91.

Equipment for low-cost repair of worn parts. Surface preparation and metal characteristics. Metalizing limitations and finishing.

22B-366. Welded Locomotive Boilers. E. C. Poultney. *Engineer,* v. 188, Sept. 23, 1949, p. 332-335.

Development of manufacturing technique and specifications governing the welding process.

22B-367. Techniques of Quality Welding of Plain Carbon Steel Castings. E. LaGrelius and J. D. Wozny. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 543-552; discussion, p. 552-554.

Previously abstracted from *American Foundrymen's Association,* Preprint 48-8. See item 22b-137, 1948.

22B-368. Welding in the Wire Industry. John H. Corson. *Wire and Wire Products,* v. 24, Oct. 1949, p. 866-867, 870-872, 984-989.

Experimental work on flash-butt and pressure welding of 0.80 and 0.65% C hot rolled rod. After welding, the material was heat treated, wire drawn, and wrap tested. Welds were examined metallographically. Weld variables, including use of special atmospheres. It was found impossible, by either method, to produce welds of a high enough quality for finished wire.

22B-369. Brazing Tool Tips by Induction Heating. *Welding,* v. 17, Oct. 1949, p. 458-459.

22B-370. Factors Affecting Quality of Production Flash Welding. E. A. Sirabian. *Welding Journal,* v. 28, Oct. 1949, p. 925-931.

Joints, materials, equipment, and tooling used in fabrication of bicycles and accessory parts. Factors

influencing quality of flash welds. 12 ref.

22B-371. Design of Welded Rigid Frame Subways. Martin P. Korn. *Welding Journal,* v. 28, Oct. 1949, p. 932-940.

Welded rigid frames for proposed new 250 subway track miles would save New York City $10,000,000. It is said that their fabrication can be geared to mass-production methods.

22B-372. Welding of Stainless Clad Steel. Perry C. Arnold. *Welding Journal,* v. 28, Oct. 1949, p. 940-945.

Problems encountered in the field erection of thin and heavy-gage stainless-clad steels and their solutions.

22B-373. How To Weld Sheet Steel. Part II. K. H. Koopman and F. J. Pilia. *Welding Journal,* v. 28, Oct. 1949, p. 976-977.

Requirements and techniques using the inert-gas-shielded arc process.

22B-374. Improved Knurl Drive for Resistance Seam Welders. R. K. Waldvogel. *Welding Journal,* v. 28, Oct. 1949, p. 978-979.

22B-375. Flash Welding Unequal Thicknesses. G. C. Farrington. *Welding Journal,* v. 28, Oct. 1949, p. 979-980.

High-production method for flash butt welding a 3-in. diam. pin to a ⅝-in. thick steel plate.

22B-376. Repair of Hoist Drum Is Tricky. P. A. Spaulding. *Welding Journal,* v. 28, Oct. 1949, p. 980-981.

Use of bronze welding for repair of cast-iron hoist drum.

22B-377. How To Repair a Cast Flange Section. H. B. Gilson. *Welding Journal,* v. 28, Oct. 1949, p. 981.

Welding sequence using bronze or fusion welding.

22B-378. Arc-Welded Beam and Column Framing. (Continued.) *Welding Journal,* v. 28, Oct. 1949, p. 982-983.

Structural details.

22B-379. Spot-Weld Consistency Studies. J. Heuschkel and H. Bitzer. *Welding Journal,* v. 28, Oct. 1949, p. 477s-483s.

Uniform, high-quality welds can be successfully produced by following a prewelding control procedure. This involves proper design, uniform material, proof-tested welding schedules, and tested equipment and controls. Report is confined to stainless and low-carbon steels. The same principles apply to other metals with detail variations.

22B-380. Spot Welding of Heavy-Gage Structural Steel. Ernest F. Nippes and Robert F. Underhill. *Welding Journal,* v. 28, Oct. 1949, p. 507s-520s.

Development of satisfactory procedures for spot welding of heavy-gage structural steel up to ½ in. in thickness. It is desirable to temper the spot in the heavier thicknesses.

22B-381. Flame-Cut Structural Silicon Steel Made Ductile. C. Earl Webb and F. H. Dill. *Engineering News-Record,* v. 143, Oct. 13, 1949, p. 38-39.

Test results which show that flame softening will make smooth flame-cut edges of structural silicon steel as ductile as machined edges. As a result, specifications may be modified to permit postheating to simplify and improve steel fabrication.

22B-382. Ship Repairs by Thermit Welding. R. A. Forster. *Iron Age,* v. 164, Oct. 20, 1949, p. 71-73.

Defective stern frames of two Matson Line freighters were repaired by thermit welding, using about 3000 lb. of thermit. Preparation and welding techniques.

22B-383. Welding Stainless Steel. Lester F. Spencer. *Iron Age,* v. 164, Oct. 20, 1949, p. 57-62; Oct. 27, 1949, p. 69-75.

First installment: behavior in the various resistance, arc and gas welding techniques; practical recommendations. Concluding part: welding various types of stainless steels by spot, seam-roller, arc, submerged-melt, inert-gas shielded-arc, and gas methods. Economies of the various techniques.

22B-384. 865-Mile Pipe Line. T. B. Jefferson. *Welding Engineer,* v. 34, Nov. 1949, p. 20-22.

Welding equipment and procedures on new 26-in. line from Texas to Ohio.

22B-385. Hollywood's All-Welded Country Club Hotel. Mark Finley. *Welding Engineer,* v. 34, Nov. 1949, p. 24-25, 28.

New 224-room, three-story hotel has structural members of lightweight alloy steel.

22B-386. Pressure-Welded Rails in Cascade Tunnel. Ray Bloomberg. *Welding Engineer,* v. 34, Nov. 1949, p. 26-28.

Equipment and procedures for laying rails.

22B-387. Custom Tailored Steel. A. S. Blodget, Jr. *Welding Engineer,* v. 34, Nov. 1949, p. 40-41.

Welding procedures in manufacture of textile feeding machines.

22B-388. Das Schweissen korrosionsbeständiger Stähle; Le soudage des aciers anticorrosifs. (The Welding of Stainless Steels.) Rudolf Pospisil. *Zeitschrift für Schweisstechnik; Journal de la Soudure,* v. 39, Sept. 1949, p. 159-166.

Properties, structures, and methods of welding of 13 different stainless steel compositions.

22B-389. Characteristics of Oxy-Acetylene, Atomic Hydrogen, and Arc Welding of Stainless Steel Sheet, Type "Ya 1-T". (In Russian.) A. G. Mazel. *Avtogennoe Delo* (Welding), May 1949, p. 1-4.

Investigated for different thicknesses of sheet and different temperatures. Electric-arc welding is best for butt welding sheet thicker than 1.5 mm.; atomic-hydrogen welding for thinner sheet. Oxy-acetylene welding should be used only when arc or atomic-hydrogen welding is not feasible.

22B-390. Oxygen Cutting of Metal Without Continuous Heating. (In Russian.) I. S. Dmitriev and N. M. Madatov. *Avtogennoe Delo* (Welding), May 1949, p. 4-7.

Method of cutting steel with a stream of oxygen in which the necessity for continuous heating of the outer layer of steel by an auxiliary heat source is eliminated. The oxygen is heated before it strikes the surface of metal to be cut by passing it through a graphite tube heated initially by the electric arc.

22B-391. Technology of Automatic Welding of Thick Steel 15-M Under Flux As Applied to a High-Pressure Boiler. (In Russian.) B. I. Lazarev and I. D. Davidenko. *Avtogennoe Delo* (Welding), May 1949, p. 10-16.

Investigated for steel 70-90 mm. thick. Longitudinal and circumferential seams completely satisfying the requirements of high-pressure boilers are obtained on such steel using high-Mn fluxes and single-pass automatic welding with electrodes of the same steel of 10-mm. diameter.

22B-392. Flux Blocking During Automatic Welding of Storage Tanks. (In Russian.) I. N. Gerasimenko. *Avtogennoe Delo* (Welding), May 1949, p. 16-17.

Use of flux blocks. Automatic welding using flux blocks is limited in its extent; suitable conditions are indicated.

22B-393. Welding of Low-Alloy Steel With High Phosphorus Content. (In Russian.) D. M. Levykin. *Avtogennoe Delo* (Welding), May 1949, p. 18-19.

A welded assembly of low-carbon, low-alloy steel containing up to 0.15% P, using given electrodes, possesses the satisfactory mechanical properties of the base metal.

22B-394. Elimination of Weld-Seam Defects by Means of a Torch for Surface Oxygen Cutting. (In Russian.) V. A. Toropov. *Avtogennoe Delo* (Welding), May 1949, p. 23-25.

Use of a specific Soviet torch for removing flaws in welds and preparing joints for welding. This torch is of the injector type. Application to welded gas-storage tanks.

22B-395. Roller Machine for Welding Stainless and Heat Resistant Steels and Alloys. (In Russian.) J. I. Kislyuk and E. M. Eskin. *Avtogennoe Delo* (Welding), May 1949, p. 27-30.

Machine is capable of welding objects up to 1.5 mm. thick.

22B-396. Induction Brazing Cuts Cost of Motorcycle. *Product Engineering*, v. 20, Nov. 1949, p. 102-103.

Die castings and induction brazing were major features of design.

22B-397. Assembly-Welding and Finishing Protectobodies. Robert I. Shore. *Products Finishing*, v. 14, Nov. 1949, p. 32-35.

Production of Coca-Cola truck body of aluminum and steel. It is finished in high-gloss enamel and trimmed with stainless-clad steel.

22B-398. Submerged-Arc Welding Speeds Double-Jointing 30-Inch Pipe in the Field. J. E. Kastrop. *World Oil*, v. 129, Nov. 1949, p. 226-227, 230, 232.

22B-399. Guest Executive on Plant Tour. *Factory Management and Maintenance*, v. 107, Nov. 1949, p. 112-117.

Procedures and equipment of Standard Tube Co., manufacturers of resistance-welded tubing. (Question and answer dialogue.)

22B-400. Carbon-Arc Welding Seals Gear Case. Fred Gandert. *American Machinist*, v. 93, Nov. 17, 1949, p. 94.

22B-401. Today's Pipe Welding Practices. F. C. Fantz. *Heating, Piping & Air Conditioning*, v. 21, Nov. 1949, p. 81-86.

Use of welding for fabrication of special assemblies from formed and welded plate and their attachment in the line.

22B-402. Reinforced Concrete Is Replaced by Field-Welded Steel Dikes. Fred L. Plummer. *Industry and Welding* v. 22, Nov. 1949, p. 26-28, 76.

Dikes are used to encircle petroleum-product storage tanks in built-up areas in order to reduce hazards in case of tank failure. Welded steel dikes and their construction.

22B-403. High Production of Small Compressors. (Concluded.) Paul M. Giles. *Industry and Welding*, v. 22, Nov. 1949, p. 43, 61.

Automatic arc welding, handling, and soldering procedures.

22B-404. Über Eigenspannungen von Punktschweissverbindungen. (Internal Stresses in Spot Welds.) Viktor Hauk. *Zeitschrift für Metallkunde*, v. 39, Sept. 1948, p. 276-279.

Internal stresses to be expected

from spot welding. Radial and tangential stresses in the vicinity of application of heat to a steel disk, in the vicinity of a single spot weld, and in the vicinity of a double row of spot welds were measured by X-ray diffraction. 24 ref.

22B-405. Construction en série de péniches soudées. (Assembly-Line Production of Welded Barges.) D. Réville. *Soudure et Techniques Connexes,* v. 3, July-Aug. 1949, p. 149-156.

Production from prefabricated structural elements. Cost savings.

22B-406. Automatic Flash Welding of Chromium-Molybdenum Steel Tubes. (In Russian.) A. S. Gel'man and N. S. Kabanov. *Avtogennoe Delo* (Welding), June 1949, p. 8-16.

Optimum conditions of operation, including post heat treatment.

22B-407. Two-Element Tool Joined by Hard Solder. (In Russian.) G. S. Belyaev. *Stanki i Instrument* (Machine Tools and Equipment), v. 20, May 1949, p. 15-17.

Method for joining, using a hard solder consisting of Cu, Fe, and Ni, with additions of Mn and Si. This solder possesses good fluidity and the soldered tool may be heat treated at 1210-1330° C. without reducing the strength of the joint.

22B-408. (Book) **Weld Design.** H. D. Churchill and J. B. Austin. 216 pages. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $6.65.

Written primarily for the machine-base designer, this volume treats the subject of design from both the practical and theoretical standpoints. Principal emphasis is on the many methods of processing plates and structural shapes to produce economical welded machine-base construction.

22B-409. Hardfacing Sand Muller Plows. *Iron Age,* v. 164, Nov. 17, 1949, p. 102.

Use of a tungsten-carbide type facing multiplied useful life of parts at least 32 times.

22B-410. Powder Cutting Buttons and Skulls. R. Smith. *Iron Age,* v. 164, Nov. 24, 1949, p. 68-69.

How Colorado Fuel & Iron applies powder cutting to chunks up to 60 in. thick for reduction to openhearth charging size. Cost data.

22B-411. Weld Repairing Heavy Truck Castings. *Iron Age,* v. 164, Nov. 24, 1949, p. 82.

Procedure for repair of Cr-Mo cast-steel arms of Elwell-Parker truck.

22B-412. Staybolt Application and Maintenance. *Railway Mechanical Engineer,* v. 123, Nov. 1949, p. 642-645.

Locomotive-boiler staybolt threading standards; application of staybolts; seal welding of staybolts, and maintenance of staybolts.

22B-413. Developments in Automatic Hard Facing. H. W. Sharp. *Welding Journal,* v. 28, Nov. 1949, p. 1037-1039. A condensation.

Fields of application of automatic hard facing and methods of operation.

22B-414. Oxygen-Acetylene Scarfing in the Steel Mill. George Mersot. *Welding Journal,* v. 28, Nov. 1949, p. 1052-1055.

Current practices in surface conditioning of steel, and procedures for conditioning various steel products by scarfing.

22B-415. Welding Metallurgy—Iron and Steel. Chapter 3. Welding Methods and Processes. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal,* v. 28, Nov. 1949, p. 1056-1064.

Reprinted from 2nd edition of book published by American Welding Society, 1949. See item 22B-217, 1949.

22B-416. Welding Conserves Steel. T. R. Mullen. *Welding Journal,* v. 28, Nov. 1949, p. 1064-1066. Reprinted from *Engineering News-Record.*

How welding saves steel in structural plate girders, trusses, bunkers, etc.

22B-417. Cam Plates, Pallets & Wedges. *Welding Journal,* v. 28, Nov. 1949, p. 1083-1084.

Used on Naval Ordnance gun mounts. Aluminum bronze hard-surfacing procedures.

22B-418. Welding Old Iron Castings. Rene D. Wasserman. *Welding Journal,* v. 28, Nov. 1949, p. 1084-1085.

Recommended repair procedures.

22B-419. The Quickest and Cheapest Way to Make a Box Beam. *Welding Journal,* v. 28, Nov. 1949, p. 1086.

Unionmelt procedure.

22B-420. Hard-Facing vs. Wear. W. C. Owens. *Welding Journal,* v. 28, Nov. 1949, p. 1086-1087.

Recommended procedure for earth-moving tools (hand or power-operated).

22B-421. Cracking in Heavy Forged Flanges of Oil Separators. H. B. Fergusson and P. L. J. Leder. *Welding Journal,* v. 28, Nov. 1949, p. 521s-526s.

Severe restraint in heavy flanges coupled with steep thermal gradients in the welding of 3-in. forged flanges of gas and oil separators presented a difficult welding problem which was solved by preheating and stress relieving. Photomicrographs and sulfur prints show defects and general structures.

22B-422. Fractographic Structures in Weld Metal. C. A. Zapffe and C. O. Worden. *Welding Journal,* v. 28, Nov. 1949, p. 527s-533s.

How toughness of weld metal deposited from various types of electrodes can be qualitatively rated on the basis of fractographic pattern. Conclusions are based on a preliminary survey of mild steel weld fractures in beads from common electrode types. 10 ref.

22B-423. Cooling Rates in Arc Welds in ½-In. Plate. Ernest F. Nippes, Lynn L. Merrill, and Warren F. Savage. *Welding Journal,* v. 28, Nov. 1949, p. 556s-564s.

Experimental and mathematical investigations of temperature, temperature gradient, and cooling rate at points adjacent to an arc weld in ½-in. steel plate.

22B-424. Heavy Section Scrap Cutting. E. M. Holub. *Blast Furnace and Steel Plant,* v. 37, Nov. 1949, p. 1335-1336.

Powder cutting of lumps of steel 5-6 ft. thick to produce pieces small enough to be charged to the open-hearth, using the Oxweld C-60 blowpipe.

22B-425. Salvaging a Liner. *Welding,* v. 17, Nov. 1949, p. 508-510.

Welding techniques for reconstruction of the fire-ravaged "Monarch of Bermuda".

22B-426. Automatic Hard Facing Speeds Production Over Manual Methods. William Price. *Materials & Methods,* v. 30, Nov. 1949, p. 64-65.

Use of submerged-arc welding for hard facing will often result in lower unit costs and more uniform deposits.

22B-427. Automatics Weld Spinner-Tub Assemblies. Fred Gandert. *American Machinist,* v. 93, Dec. 1, 1949, p. 104-107.

Picture story shows how hand-welding techniques have been replaced by automatic submerged-arc and coated-electrode welders, in conjunction with resistance spot welders. Includes press operations.

22B-428. New Melting Shop at Abbey Works for the Steel Company of Wales Ltd. J. Warley. *Welder,* v. 18, July-Sept. 1949, p. 51-54.

Use of welding in construction.

22B-429. 250-Ton Horizontal Press. J. E. Willey. *Welder,* v. 18, July-Sept. 1949, p. 55-57.

Use of welding in construction.

22B-430. Castellated Beams. *Welder,* v. 18, July-Sept. 1949, p. 58-59.

Construction by flame cutting and welding of a special type of structural member of superior strength properties.

22B-431. Automatic Stud Welder for Steel Truss Cords. *Sheet Metal Worker,* v. 41, Nov. 1949, p. 38.

17-gun stud welder used to secure fasteners to a crimped section which forms the bottom chord of half-roof trusses, 15 ft. 6 in. long.

22B-432. Electronics Open New Fields for Presses in Manufacture of Ford Station Wagon Units. P. D. Aird. *Modern Industrial Press,* v. 11, Nov. 1949, p. 13-14, 16, 52.

Use of presses to bond wood to steel, using adhesive resins.

22B-433. Soudabilité et ductilité. (Weldability and Ductility.) A. B. Kinzel, D. Swan, and H. Biers. *Soudure et Techniques Connexes,* v. 3, May-June 1949, p. 115-124; discussion, p. 124-126.

Literature review; theoretical considerations; experimental methods; experimental results and certain conclusions concerning the effects of various factors on the ductile or nonductile behavior of welded structures.

22B-434. Récents essais faits en Suisse en matière de soudure oxy-acétylénique de l'acier. (Recent Experiments on Oxy-Acetylene Welding of Steel in Switzerland.) C. G. Keel. *Soudure et Techniques Connexes,* v. 3, May-June 1949, p. 127-137.

A forehand welding procedure followed by torch heat treatment of the weld while still hot. The temperature is raised to above the Ac_3 point, resulting in considerable increase of the fatigue strength of the weld.

22B-435. The Influence of Core Wire on the Characteristics of Low Carbon Steel Welding Electrodes. C. B. Voldrich, D. C. Martin, and P. J. Rieppel. *Yearbook of the American Iron and Steel Institute,* 1949, p. 397-458; discussion, p. 459-468.

Previously abstracted from preprint. See item 22B-172, 1949.

22B-436. Automatic Stud Welder Slashes Operation Time. *Production Engineering & Management,* v. 24, Dec. 1949, p. 65-66.

How 17 studs are automatically welded to the bottom chord of trusses in a machine-cycle time of 6 sec.

22B-437. Railroad Shop Welding. Fred M. Burt. *Welding Engineer,* v. 34, Dec. 1949, p. 24-27.

Procedures and equipment of Southern Pacific's Los Angeles shops. Welding, hard facing, inspection, flame hardening, flame cutting, and metallizing.

22B-438. Multiple-Section Welded

Stampings Cut Auto Finishing Costs. R. H. Bennewitz and F. J. Pilia. *Steel,* v. 125, Dec. 12, 1949, p. 88-90, 120.

Procedures and equipment. Heliarc welding is used.

22B-439. Chrome Pipe Welding Improved by New Methods and Rigid-Shop Procedure. C. G. Herbruck. *Steel,* v. 125, Dec. 12, 1949, p. 94, 112.

Processing of pipe for steam and sour crude-oil usage.

22B-440. Engineered Backup Rings. *Industry and Welding,* v. 22, Dec. 1949, p. 17-19.

Proper procedure for use in welding of pipe.

22B-441. Resistance Welded Fasteners. R. A. Reich. *Industry and Welding,* v. 22, Dec. 1949, p. 27.

Small projections called "embossments" are used to localize current flow and heat at predetermined points during the welding operation.

22B-442. How To Weld Pipe With the Oxy-Acetylene Method. F. C. Geibig. *Industry and Welding,* v. 22, Dec. 1949, p. 28-30, 33, 48, 50-51.

22B-443. New Methods of Oxygen Cutting Stainless Steel. E. Seymour Semper. *Transactions of the Institute of Welding,* v. 12, Oct. 1949, p. 125-132.

The powder-cutting method, oxy-arc cutting, and flux-injection cutting. Apparatus and results. Micrographs show structures.

22B-444. An Evaluation of the Resistance Welding of Tin and Tin-Zinc Alloy Coated Mild Steel Sheet. A. J. Hipperson and P. M. Teanby. *Welding Research,* v. 3 (bound with *Transactions of the Institute of Welding,* v. 12), Oct. 1949, p. 86r-92r.

Applicability of spot and flash welding to coated sheet steel assemblies in production was investigated, especially modifications in technique compared with uncoated sheet. No difficulty was encountered in flash welding any of the coated steels, and properties of the joints were comparable with those obtained in uncoated sheet. Sn-Zn alloy coatings were found to be better suited to spot welding than plain tin coatings. The presence of Zn appeared to improve weldability considerably.

22B-445. Causes of Porosity in Welds. J. D. Fast. *Philips Technical Review,* v. 11, Oct. 1949, p. 101-110.

Attempts to develop a satisfactory explanation for the formation of porosity in electric-arc welding of steel, on the basis of experimental work and theoretical analysis. Lumps of iron were melted and allowed to solidify in vacuum and in various atmospheres. Porosity is believed to be largely due to gas entrapment. Differences in effects of different atmospheres and of gas-forming electrode coatings and metals. 13 ref.

22B-446. Beitrag zum Einfluss der Schneidwärme bei der Herstellung von Schweissproben aus St 52. (The Effect of Cutting Heat in the Preparation of Weld Specimens of St 52.) *Schweissen und Schneiden,* v. 1, Aug. 1949, p. 131-132.

Comparison of sawed and flame-cut specimens of St-52 steel shows that their respective tensile strength is the same, but that angle of bending (in bending tests) is smaller and notch-impact toughness of flame-cut specimens is greater than that of sawed specimens. Steels St-34, St-37, and St-42 were not affected.

22B-447. Multiarc Welding. (In Russian.) K. V. Zvegintseva. *Avtogennoe Delo* (Welding), July 1949, p. 1-4.

Method using two carbon electrodes and one metallic electrode is especially applicable to welding of sheet steel 0.5-1.0 mm. thick. Quality of weld seam and width of heat-affected zone compare favorably with and sometimes surpass those obtained by other methods.

22B-448. Investigation of Strength of Welded Construction Subject to Impact Stress. (In Russian.) G. I. Pogodin-Alekseev. *Avtogennoe Delo* (Welding), July 1949, p. 4-8.

Impact strength of I-beams, in which the webs are constructed of several sheets of metal. It was found that such sheets should not be welded continuously along their length, but across their ends and discontinuously along their length.

22B-449. The Problem of Practical Safety Factors in Welded Joints. (In Russian.) Ya. M. Likhtarinkov. *Avtogennoe Delo* (Welding), July 1949, p. 8-10.

Safety factors for steel developed as a result of practical experience and statistical analysis.

22B-450. Automatic Unidirectional Spot Welding of Steel. (In Russian.) F. E. Tret'yakov and G. I. Motin. *Avtogennoe Delo* (Welding), July 1949, p. 13-15.

Possibility of replacing manual arc welding of all-metal joint assemblies by automatic spot welding. Equipment, including electrical circuits. Operating conditions for different thicknesses of sheet.

22B-451. New Method for Thermit Welding of Rail Junctions in Trolley Tracks. (In Russian.) V. V. Lapskin and M. I. Login. *Avtogennoe Delo* (Welding), July 1949, p. 19-20.

Method is characterized by the fact that the molten thermit is applied inside a mold and does not touch the rail head. This method produces a very strong joint (able to withstand a static load of 45-60 tons).

22B-452. Automatic Welding of Storage Tanks at Low Temperatures. (In Russian.) A. S. Fal'kevich and V. S. Volodin. *Avtogennoe Delo* (Welding), July 1949, p. 21-24.

Applicability of automatic welding to storage tanks made from low-carbon steel sheets at low temperatures (down to −20° C.) was confirmed by investigation of mechanical and structural properties of welds, leak testing, and observations on crack formation.

22B-453. Semi-Automatic Welding Under Flux Using a Flexible Cable. (In Russian.) B. E. Paton, D. A. Dudko, and I. N. Rublevskii. *Avtogennoe Delo* (Welding), Aug. 1949, p. 6-9.

Electric welding using a special cable to connect the automatic welding machine to a manually operated electrode. Applicability in cases of short curved seams not easily accessible to the usual automatic devices. Influence of various factors, such as diameter of electrode, composition of flux, etc., and equations relating these factors to quality of the weld.

22B-454. General-Purpose Manual Apparatus for Welding Under Flux. (In Russian.) N. E. Nosemko. *Avtogennoe Delo* (Welding), Aug. 1949, p. 10-12.

Equipment, including electrical circuit and optimum operating conditions.

22B-455. Multilayer Automatic Welding Under Flux of Cylindrical Parts of "Cromansil" Steel. (In Russian.) Ya. A. Zav'yalov. *Avtogennoe Delo* (Welding), Aug. 1949, p. 13-14.

Suitability of the above process to circumferential welds on objects made from 30-mm. thick Cromansil steel. Both output and quality were greatly increased. Chemical composition and mechanical properties of the weld.

22B-456. Modern Water Main Construction. V. I. Laverty. *Canadian Metals and Metallurgical Industries,* v. 12, Nov. 1949, p. 18-19, 44.

Production of welded steel pipe for the water mains.

22B-457. The Functions and Uses of Hardfacing. J. J. Barry. *Steel Processing,* v. 35, Nov. 1949, p. 592-595.

Service conditions are divided into four broad groups and the hardfacing alloys used for each group summarized. Photomicrographs show structures of the different deposits. (To be continued.)

22B-458. Welded Pipe-Lines. Rolt Hammond. *Welding,* v. 17, Dec. 1949, p. 522-531.

Construction of pipelines in a number of different countries. Special equipment recently developed for this work.

22B-459. Manufacture of All-Welded Power Presses. *Welding,* v. 17, Dec. 1949, p. 532-538.

Procedures of Clearing Machine Corp., Chicago.

22B-460. Repair of Iron Castings: An Improved Type of Joint Design. G. G. Musted. *Welding,* v. 17, Dec. 1949, p. 539-543.

Special technique in which mild-steel tubing or sections are placed inside the joint or alongside the the fracture. In this way, necessity for preheating and slow cooling is avoided. Usually bronze welding is used to "tack" the pieces together. Ordinary welding is then done usually followed by peening while hot.

22B-461. Sugar Beet Equipment Penetration Welding Effects Big Economies. *Welding,* v. 17, Dec. 1949, p. 544-547.

Arc welding for construction of pressure cookers used in the sugar-beet industry.

22B-462. Fabrication of Large Alloy-Steel Shovel Buckets. E. R. McClung. *Welding Journal,* v. 28, Dec. 1949, p. 1133-1141.

Welding of high-yield-strength armor-type alloy steels for shovel buckets is a relatively new development. Fabrication problems.

22B-463. Silver Alloy Brazing Stainless Steel. C. H. Chatfield and A. W. Swift. *Welding Journal,* v. 28, Dec. 1949, p. 1142-1146.

Specific problems include cleaning and fluxing, carbide precipitation, types of stress cracking, corrosion resistance, and tensile strength of the joints.

22B-464. Economical Design of Welded Buildings. Robert E. Robertson. *Welding Journal,* v. 28, Dec. 1949, p. 1152-1161.

Emphasizes need for designing specifically for welding, instead of merely applying welding to a design made with riveting in view.

22B-465. Cutting Maintenance Costs With Aluminum-Bronze Electrodes. Joseph A. Cunningham. *Welding Journal,* v. 28, Dec. 1949, p. 1162-1165.

Use for overlaying worn parts and repairing broken parts.

22B-466. Welding Metallurgy—Iron and

Steel. Chapter 4. Temperature Changes in Welding. O. H. Henry, G. E. Claussen, and G. E. Linnert. *Welding Journal,* v. 28, Dec. 1949, p. 1166-1171.

Reprinted from 2nd edition of book of above title (previously abstracted, 22B-217, 1949).

22B-467. Resistance Brazing of Heat Exchanger. G. C. Farrington. *Welding Journal,* v. 28, Dec. 1949, p. 1172.

Setup used and physical tests of the brazed assembly.

22B-468. Production Doubled With Elevating Positioner. *Welding Journal,* v. 28, Dec. 1949, p. 1174-1175.

By using a positioner mounted on a quick-acting elevator, a gland ring was welded, top and bottom, to a pump-liner shell without removing it from the positioner and without changing the level of the Unionmelt welding head.

22B-469. How To Do Steel Welding. C. H. Wanamaker. *Welding Journal,* v. 28, Dec. 1949, p. 1177-1180.

Recommended procedures for welding steel ⅛ in. or thicker.

22B-470. Influence of Consumption Rates on Flash Welding. W. N. Platte. *Welding Journal,* v. 28, Dec. 1949, p. 584s-598s.

Effect of material thickness, consumption rate, voltage current, and temperature. Optimum flashing schedules were established. Two sizes of low-carbon steel, hot-rolled bar stock were investigated.

22B-471. Tests of Specimens Simulating Weld Heat-Affected Zones. Ernest F. Nippes and Warren F. Savage. *Welding Journal,* v. 28, Dec. 1949, p. 599s-616s.

A time-temperature control device permits exact duplication of heating and cooling cycles by use of a cam. Using information obtained from previous studies of time-temperature relationships near an arc weld, suitable cams were made to duplicate several of the heat-affected structures associated with arc welds in ½-in. Al-killed steel plate. The device was used to produce specimens of each structure for impact testing. Results of Charpy-Izod tests.

22B-472. Steel Castings in Welded Assemblies. John Howe Hall. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 1-23.

Surveys literature on the use. Thermit welding and properties of weld metal and parent metal. 13 ref.

22B-473. Latest Applications of Heliarc Welding. R. H. Bennewitz and F. J. Pilia. *Automotive Industries,* v. 101, Dec. 15, 1949, p. 38-40, 60, 62.

See abstract from *Steel,* item 22B-438, 1949.

22B-474. Over gemengde lasrupsen. (Concerning Miscellaneous Weld Beads. Part I.) A. Ph. Krijff. *Smit Mededelingen,* v. 4, July-Sept. 1949, p. 65-71.

Results of Vickers hardness measurements and microstructure determinations for various types of welds in steel and at different locations in the weld.

22C—Nonferrous

22C-1. Welding High Purity Molybdenum. Julius Heuschkel. *Iron Age,* v. 162, Dec. 16, 1948, p. 86-89.

Inert-gas-shielded arc welding, spot welding, flash welding, and percussion welding experiments.

22C-2. R-F Brazing of Radio Components. R. A. Nielson. *Electronics,* v. 22, Jan. 1949, p. 111.

Briefly described as applied to a specific example.

22C-3. The Welded Joint in Non-Ferrous Chemical Plant. W. K. B. Marshall. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 31-40; discussion, p. 40-42.

Mechanical testing of welds; physical and metallurgical factors affecting mechanical properties and corrosion resistance of weld metal and adjacent metal. Typical nonferrous weld structures. Chemical-plant applications.

22C-4. The Welding of Lead; Applications and Techniques. G. F. Charge and R. Beynon. *Welding,* v. 16, Dec. 1948, p. 527-532.

The techniques of lead welding, including the necessary types of edge preparation and the equipment required. (To be concluded.)

22C-5. The Welding of Lead; Applications and Techniques. G. F. Charge and R. Beynon. *Welding,* v. 17, Jan. 1949, p. 24-29, 37.

Modern techniques for carrying out work in various operating positions.

22C-6. The Welding of Non-Ferrous Metals. (Concluded.) **XII. The Welding of Low Melting Point Metals. XIII. The Welding of High Melting Point Metals. XIV. The Welding of the Precious Metals.** E. G. West. *Sheet Metal Industries,* v. 25, July 1948, p. 1405-1406, 1409; Aug. 1948, p. 1621-1626; Oct. 1948, p. 2046-2047; Nov. 1948, p. 2265-2268, 2271.

Final installments of a series to be published in book form.

22C-7. Recent Developments in the Pressure Welding of Light Alloys. R. F. Tylecote. *Sheet Metal Industries,* v. 26, Jan. 1949, p. 161-168.

Results of some work on copper alloys are also included.

22C-8. Materials Joined by New Cold Welding Process. A. B. Sowter. *Welding Journal,* v. 28, Feb. 1949, p. 149-152.

Previously abstracted from *Materials & Methods,* item 22c-29, 1948.

22C-9. Rubber in Engineering. The Products and Manufacturing Methods of Silentbloc, Ltd., and Andre Rubber Co., Ltd. *Automobile Engineer,* v. 39, Feb. 1949, p. 61-69.

Brass-plating technique used in the preparation of metal components for rubber-to-metal units and the molding technique for production of these parts.

22C-10. Silver Alloy Brazing Beryllium-Copper Alloys. A. M. Setapen and W. D. Warren. *Welding Journal,* v. 28, Mar. 1949, p. 243-246.

A method which permits Be-Cu alloys to be brazed with silver alloys that flow at 1145-1200° F. with subsequent development of full hardness.

22C-11. Shear Impact and Shear Tensile Properties of Adhesives. Irving Silver. *Modern Plastics,* v. 26, May 1949, p. 95-97, 136-138.

Previously abstracted from condensed version, item 22A-55, 1949.

22C-12. How to Evaluate Solder Efficiency. Clifford L. Barber. *American Machinist,* v. 93, May 5, 1949, p. 110-113.

Careful tests made under controlled conditions reveal interesting data on the efficiency of various alloys for soldering. Data for 22 compositions.

22C-13. The Welding of Pure Molybdenum. H. J. Nichols, K. B. Young, and M. J. Nolan. *Welding Journal,* v. 28, May 1949, p. 236s-239s.

Some preliminary results obtained in welding Mo of 99.9% purity, and the necessity of proper welding precautions. The pseudowelds obtained in molybdenum with common welding processes are quite brittle; reasons for this.

22C-14. "Glo-Coat" Welded Twins. Clyde B. Clason. *Welding Engineer,* v. 34, June 1949, p. 30-32.

Unusual application of spot welding to the packaging field. Two cans are joined into one package.

22C-15. Soudure électrique en bout du cuivre et de l'aluminium pour la substitution, efficace de l'un a l'autre dans les conducteurs électriques. (Electric Buttwelding of Copper and Aluminum for the Efficient Substitution of One for the Other in Electrical Conductors.) Gabriel Duch. *Comptes Rendus* v. 228, Mar. 7, 1949, p. 844-846.

New method.

22C-16. Application of Electric Contact Soldering Using a Copper Phosphide Solder. (In Russian.) Z. M. Ryzhik. *Avtogennoe Delo* (Welding), Feb. 1949, p. 24-25.

For different types of joint. Application to electrical-contact joining is said to be a highly efficient process.

22C-17. Technology of Welding Zinc-Alloy Machine Parts. (In Russian.) P. A. Radkevich. *Avtogennoe Delo* (Welding), Feb. 1949, p. 31.

Method, with special reference to repair of broken parts.

22C-18. Details of Some Interesting Manufacturing Operations at Ascot Gas Water Heaters Ltd. J. Moore and H. Penfold. *Sheet Metal Industries,* v. 26, May 1949, p. 1005-1007, 1014.

Some brazing operations. (To be continued.)

22C-19. Getting Ready to Bronze Weld. K. H. Koopman. *Welding Journal,* v. 28, June 1949, p. 568.

Cleaning and joint preparation.

22C-20. Details of Some Interesting Manufacturing Operations at Ascot Gas Water Heaters Ltd. (Continued.) W. Walters and E. Amis. *Sheet Metal Industries,* v. 26, June 1949, p. 1251-1254.

Forming operations, hot-dip finishing, soldering, forming and piercing, pressure testing, and assembly. (To be continued.)

22C-21. Welding Dissimilar Metals. *Product Engineering,* v. 20, July 1949, p. 101.

Use of resistance welding for joining tungsten contact disks to steel vibrator springs.

22C-22. Radiator Core Soldering Oven. Fred C. Dietrich. *Industrial Gas,* v. 28, July 1949, p. 13.

Equipment used in the manufacture of tubular radiator cores. Pretinned brass tubes are soldered to copper fins.

22C-23. La soudabilité des métaux nonferreux et les résultats de leur soudage au chalumeau oxy-acétylénique. (Weldability of Nonferrous Metals and Results Obtained by Welding Them With the Oxy-Acetylene Flame), Ed. Henrion. *Revue de la Soudure; Lastijdschrift,* v. 5, No. 1, 1949, p. 16-18.

Experimentally investigated for a series of light-metal alloys (Al-Mg_3,

Al-Mg_5, Al-Mg_7,), differently heat treated. Results indicate the possibility of perfect welding of materials using the oxy-acetylene flame as the source of local heating.

22C-24. Soldering Does Not Affect Properties of Cold Rolled Copper. Edwin Laird Cady. *Materials & Methods*, v. 30, Aug. 1949, p. 75-76.

Tests indicate truth of above statement.

22C-25. Are You Welding Everdur? *Industry and Welding*, v. 22, Sept. 1949, p. 19-22.

Fabrication and inert-arc welding of Everdur hot-water tanks.

22C-26. Joining Wrought Nickel and High-Nickel Alloys. K. M. Spicer. *Welding Journal*, v. 28, Sept. 1949, p. 852-861.

Welding and brazing of Ni, monel, Inconel, "K" monel, "Z" nickel, and Inconel "X" by all applicable processes.

22C-27. Brazed Assembly. Lawrence Jacobsmeyer. *Metal Progress*, v. 56, Oct. 1949, p. 511.

Change of machined casting to copper brazed assembly saves 75% of cost.

22C-28. High-Frequency Brazing. G. E. C. Equipment for Tungsten Carbide Tips. *Automobile Engineer*, v. 39, Sept. 1949, p. 360.

Equipment of General Electric Co., Ltd., designed for brazing tungsten carbide tips.

22C-29. Copper Welding by the Carbon Arc Process. I. H. Child. *Welding*, v. 17, Oct. 1949, p. 455-457.

Principles, joint preparation, design points, and practical examples of use of the process in the electrical industry.

22C-30. Die Schweissung von Fahrdrähten aus Kupfer. (The Welding of Copper Trolley Wires.) H. H. Grix and K. Boeckhaus. *Schweissen und Schneiden*, v. 1, July 1949, p. 109-114.

Principles of copper welding. Compares tensile strength of welded trolley wires with those secured by clamps. Electrical resistance measurements indicate no difference between welded and unwelded wires.

22C-31. Joining Parts to Passivated Zinc Surface Accomplished Through Resistance Welding. *Materials & Methods*, v. 30, Nov. 1949, p. 73-74.

New, rapid spot welding method solved a difficult joining problem and permitted use of more economical finishing methods.

22C-32. Cold Welding Introduced Here. *Sheet Metal Worker*, v. 41, Nov. 1949, p. 35-36.

Welding process developed in England which requires no heat, electricity, or chemicals. Simple and inexpensive, it is believed that it will be widely used in nonferrous metals fabrication.

22C-33. Internal Sealing of Spark Plug Insulators. Karl Schwartzwalder and Carl F. Schaefer. *American Ceramic Society Bulletin*, v. 28, Nov. 15, 1949, p. 455-458.

Process for producing a hermetic seal within a ceramic spark-plug core insulator, between the halves of a two-piece electrode and the insulator. A mixture of glass and copper is compressed while in the hot plastic state.

22C-34. Solderability of Lead-Tin Alloy Plating. Lawrence H. Seabright. *Iron Age*, v. 164, Dec. 8, 1949, p. 93-96.

Various finishes for use as a preliminary coating in soldering of electrical equipment. Feasibility of Pb-Sn alloy plating and comparison of its solderability with that of hot-dip solder coating and pure-tin electroplating.

22C-35. Pressure Welding at Room Temperatures. *Product Engineering*, v. 20, Dec. 1949, p. 149.

New British process which has been successfully applied to Al, Cd, Cu, Ni, Zn, and Ag. It has now been licensed in the U. S. through Koldweld Corp., New York. Applications.

22C-36. Automatic Brazing Machine Triples Production. Fred Gandert. *American Machinist*, v. 93, Dec. 15, 1949, p. 90.

Heated by natural gas and using preformed silver-solder rings, turntable machine cuts assembly costs of electric water heaters.

22C-37. Soldering of Gas Apparatus With High-Phosphorus Copper Solder. (In Russian.) Z. M. Ryzhik. *Avtogennoe Delo* (Welding), July 1949, p. 26-27.

Chemical composition of solder, methods of production, and application. Experimental investigation shows that P content may be increased from the usual 6-8% to 12-14%. Use in soldering of brass gas-burner tubes.

22C-38. Resistance Welding Reduces Weight of Fire Extinguishers. *Machinery* (American), v. 56, Dec. 1949, p. 164-165.

Silicon-bronze sheet is used for the cylinder.

22D—Light Metals

22D-1. Arc Welding of Aluminium and its Alloys. (Continued.) A. Schärer. *Light Metals*, v. 11, Dec. 1948, p. 664-

671. Translated from the German. (A doctorate thesis.)

Special problems associated with the welding of alloys containing magnesium. Mechanical properties of weld metal and photomicrographs showing structures.

22D-2. Repair Welding Light Metal Castings. A. V. Lorch. *Foundry*, v. 77, Jan. 1949, p. 74-75, 134, 137, 140, 142.

Various standard welding-repair methods for Al and Mg castings. Data on welding conditions; information on corrosion resistance of the weld metal. 11 ref.

22D-3. Aluminum Tanks Fabricated Speedily With Heliarc Process. *Sheet Metal Worker*, v. 39, Dec. 1948, p. 43.

22D-4. Cold Pressure Welding. *Machinery* (London), v. 73, Dec. 16, 1948, p. 832-834.

Process developed by General Electric Co., Ltd., particularly for application to aluminum.

22D-5. Cold Welding. *Welding Engineer*, v. 34, Jan. 1949, p. 33-35.

New British process in which dies are used to "weld" lapped sheets of aluminum together.

22D-6. Fabricating Aluminum Fuel Tanks With the Heliarc Process. *Welding Journal*, v. 28, Jan. 1949, p. 59-60.

22D-7 (Book). **Investigation on the Welding of High-Strength Aluminum Alloys.** (PB 92831). 63 pages. 1948. Library of Congress, Photoduplication Service, Publication Board Project, Washington. Photostat, $8.75; microfilm, $3.00.

New findings on the above are described. Three approaches to the improvement of welded joints are discussed: the development of improved filler metals; the effects of various heat treatments; and the use of unorthodox joining methods including cold pressure welding. As part of the study carried out by Battelle Memorial Institute for the Army, determinations were made of the strength properties of joints in thick high-strength aluminum alloy plates, welded by conventional processes with currently available filler materials. (From review in *Light Metal Age*.)

22D-8. Welding for Wire-Drawing. J. Hutchinson. *Wire Industry*, v. 16, Jan. 1949, p. 47, 49-50; discussion, p. 50.

Principles of resistance welding in general; spot welding of light-alloy rod to be used in wiredrawing.

22D-9. The Tensile Strength of Gas Welds in a Magnesium-Manganese Alloy. J. Pendleton. *Sheet Metal Industries*, v. 25, Aug. 1948, p. 1628-1634, 1636; Sept. 1948, p. 1841-1846, 1848.

Experimental investigation using three 1.5% Mn, commercial Mg alloys in sheet form and four types of rods. Mechanical properties and microstructures obtained; the effect of cold work on grain growth; the effect of tacks and re-starts; effects of various heat treatments; and possible effects of stress corrosion. 11 ref.

22D-10. Further Examination of the Tensile Strength of Gas Welds in a Magnesium-Manganese Alloy. J. Pendleton. *Sheet Metal Industries*, v. 25, Oct. 1948, p. 2049-2052.

Findings reported in a previous paper on the same subject were not confirmed by other workers. Further work was done to determine reasons for the discrepancy. Conclusions based on this and the previous work.

22D-11. Joining Heavy Aluminum Sections Simplified by Gas-Shielded Arc Welding. *Materials & Methods*, v. 29, Feb. 1949, p. 65.

The conventional non-consumable electrode is replaced by a continuously fed consumable wire for gas-shielded arc welding of heavy sections of aluminum and Al alloys.

22D-12. Heliwelding Used as Repair Tool. *Iron Age*, v. 163, Feb. 17, 1949, p. 92.

Replacement of a bottom on an aluminum chemical-storage tank.

22D-13. Arc Welding of Aluminium and its Alloys. (Continued.) A. Schärer. *Light Metals*, v. 12, Jan. 1949, p. 12-19. Translated from the German.

Mechanical properties and microstructures of arc and gas-welded alloys of the Avional-M (Al-Cu-Mg type). (To be concluded.)

22D-14. Wiped Joints for Aluminium Sheathed Cables. *Engineer*, v. 187, Jan. 28, 1949, p. 102-103.

A method substantially similar to the familiar lead-wiping process.

22D-15. Arc Welding of Aluminium and its Alloys. (Concluded.) A. Schärer. *Light Metals*, v. 12, Feb. 1949, p. 109-112; discussion, p. 112-114. Translated from the German. (A doctorate thesis.)

Concluding article summarizes the results of the research hitherto reported. Discussion consists of a critical commentary by E. G. West.

22D-16. Spot Welding of Titanium. *Metal Progress*, v. 55, Feb. 1949, p. 200, 252, 254. Condensed from paper by R. S. Dean, J. R. Long, E. T. Hayes, and D. C. Root, *Transactions*

of the American Institute of Mining and Metallurgical Engineers, v. 171, 1947, p. 431-438.

A demonstration of the feasibility of welding titanium, rather than an exhaustive study of spot welding.

22D-17. Inert-Arc Plug Welding of Aluminum. K. N. Smith. *Industry and Welding,* v. 22, Mar. 1949, p. 58-60.

Recommended procedures.

22D-18. Porosity: A Problem in Welding Light Metals. T. Lundberg. *Welding,* v. 17, Feb. 1949, p. 72-77.

Causes and mechanism of porosity formation when arc welding aluminum and its alloys. Methods of reducing effects of hydrogen.

22D-19. The Electric Welding of Aluminium and Its Alloys. G. FitzGerald-Lee. *Aircraft Engineering,* v. 21, Feb. 1949, p. 55, 54.

Some problems involved; recommended procedures.

22D-20. Welded Aluminum Boats. *Welding Journal,* v. 28, Mar. 1949, p. 263.

Methods of production.

22D-21. Developments in the Metallurgy and Technique of Welding Aluminium Alloys. P. T. Houldcroft. *Metallurgia,* v. 39, Feb. 1949, p. 206-209.

High-strength, medium-strength, and new medium-strength alloys; cracking; welding generators; and Argonarc, resistance and pressure welding. 46 ref.

22D-22. Heliarc Welding Light Metals. *Modern Metals,* v. 5, Mar. 1949, p. 31-35.

Process, equipment, and applications. Details for different types of Al and Mg welds.

22D-23. Quick Welding of Aluminum Products. William Lukemeier. *Welding Engineer,* v. 34, Apr. 1949, p. 36-37, 73.

Simple fixtures for inert-gas-shielded arc welding which enable rapid production of aluminum showerstall bases and reinforcing frames for milk-bottle cases. Neither fluxing nor finishing are required.

22D-24. Rebuilding Wheels of Mine Locomotives. *Welding Engineer,* v. 34, Apr. 1949, p. 38-39.

Use of submerged-melt welding for the above.

22D-25. The Pressure-Butt Welding of Light Alloy Bar. R. F. Tylecote. *Welding Research,* v. 3, (bound with *Transactions of the Institute of Welding,* v. 12), Feb. 1949, p. 2r-16r.

The materials investigated were Al and Mg alloys representative of those available commercially. Details of apparatus, temperature-measurement procedure, surface preparation, and welding procedure. Chemical composition and physical properties of the alloys used. Temperature gradients, influencing factors, and effects on weld strength. Properties and macro and microstructures.

22D-26. Are You Fabricating Sheet Metal? L. R. Jones. *Industry and Welding,* v. 22, Apr. 1949, p. 26-29, 65.

Use of carbon-arc with solder on light gage metal with a Si-bronze filler rod. Distortion elimination, arc welding, handling, finishing, research and development, and welding of stainless-clad and Inconel-clad metals.

22D-27. Boeing's Stratojet. Howard E. Jackson. *Industry and Welding,* v. 22, Apr. 1949, p. 38-41, 44.

Resistance welding practice. Control and inspection methods.

22D-28. Aluminum Passenger Car Parts. *Railway Mechanical Engineer,* v. 123, Apr. 1949, p. 209-211.

Welding and bending equipment and procedures in the production of aluminum furniture and other equipment.

22D-29. Aluminum Wire. Part II. Welding for Wire-drawing. J. Hutchinson. *Wire and Wire Products,* v. 24, Apr. 1949, p. 336-338; discussion, p. 360-363.

General principles, recommended procedures for spot and butt welding light-alloy rod before wire drawing, and advantages and disadvantages of the two procedures. (To be continued.)

22D-30. Reparaturschweissung an einem 6-Zylinder-Leichtmetall-Motorblock. (Repair Welding on a 6-Cylinder Light-Metal Engine Block.) Friedrich Deutsch. *Schweisstechnik,* v. 2, Apr. 1948, p. 42.

Methods for repair job.

22D-31. Die elektrische Lichtbogenschweissung des Aluminiums und seiner Legierungen. (Electric Arc Welding of Aluminum and Its Alloys.) E. Hawlik. *Schweisstechnik,* v. 2, June 1948, p. 75-76; July 1948, p. 82-84.

A successful method of welding aluminum and its alloys. Proper kind of Al electrodes, welding apparatus, and electrical conditions. Photographs, microphotographs, and radiographs of welded seams.

22D-32. Soldering Aluminum. J. F. Whiting. *Canadian Metals and Metallurgical Industries,* v. 12, Apr. 1949, p. 22-23.

22D-33. Typewriter Parts Fixtured for

Induction Brazing. *Iron Age,* v. 163, Apr. 28, 1948, p. 87.

Fixtures and procedures used to fabricate typewriter carriages from three steel stampings.

22D-34. Welding of Aluminum and Its Alloys. E. G. West. *Engineering,* v. 167, Apr. 8, 1949, p. 317-319; Apr. 15, 1949, p. 341-342.

The present status, with particular reference to investigations now under way by several associations concerned with welding research.

22D-35. Cyclotrons: Une curieuse utilisation du soudage par etincelage. (Cyclotrons: An Unusual Application of Flash Welding.) Henri Lebouteux and Maurice Victor. *Revue de l'Aluminium,* v. 26, Mar. 1949, p. 92-96.

In the Rochester cyclotron, flat aluminum bars were flash welded into a strip of the desired length. For the McGill University and the Brookhaven Laboratory cyclotrons the same result was obtained by continuous extrusion of hollow shapes 1600 ft. long. Equipment and procedures.

22D-36. Supersonic Tinning of Aluminium Wires. *Machinery* (London), v. 74, Apr. 28, 1949, p. 546-547. Condensed from BIOS Report No. 1844.

Method developed by Trendelburg and Schofer in Germany of making soldered joints without flux.

22D-37. Decrease of Deformation During Welding by Peening the Seams. (In Russian.) V. M. Rybakov. *Avtogennoe Delo* (Welding), Dec. 1948, p. 20-21.

Tabulated and charted data of experimental investigation indicates that peening considerably decreases the deformation caused by welding. The extent of such decrease was found to depend on the width of the zone of shrinkage and on yield points of the fused-on and the base metal.

22D-38. Furnace Brazing Aluminum Refrigerator Parts. J. N. Woolrich. *Iron Age,* v. 163, May 26, 1949, p. 62-65.

Techniques used in the volume production of liners, evaporators, and shelves for home freezers and refrigerators. Why aluminum-brazed assemblies were selected in preference to other possibilities; and various methods of applying the brazing alloy and the importance of controlling furnace temperature.

22D-39. (Book) **Riveting Alcoa Aluminum.** 61 pages. 1948. Aluminum Company of America, Pittsburgh, Pa.

Materials, driving methods, protection of joints.

22D-40. Le collage des alliages légers. (Bonding Light Alloys.) Pierre Prévot. *Revue de l'Aluminium,* v. 26, Apr. 1949, p. 123-130.

Possibility of use of synthetic-resin bonding as a substitute for riveting and welding in structural design. Shearing stresses of 2850-5700 lb. per sq. in. have already been attained. Results of a detailed theoretical and experimental study of such joints. (To be continued.)

22D-41. Welded Joints in Thick Aluminum Plates. C. B. Voldrich. *Welding Journal,* v. 28, June 1949, p. 275s-288s.

Materials tested and the welding method. Tests of argon-arc welds in 1½-in.-thick 3S plate showed that the welded joints had tensile-strength properties equal to those of the parent material, even at liquid-nitrogen temperature (−320° F.). Influence of welding heat on properties in regions remote from the weld area.

22D-42. How to Braze Aluminum. Floyd A. Lewis. *Iron Age,* v. 164, July 7, 1949, p. 78-82.

Brazing is applicable to long production runs and resulting joints are comparable in strength with welded assemblies. Types of Al which can be brazed, methods of brazing, types of filter material, fluxing procedures, and cleaning.

22D-43. Weld Fabrication of High-Pressure Containers From "AMTs" Aluminum-Alloy Sheet. (In Russian.) D. A. Litvinov and D. A. Kochergin. *Avtogennoe Delo* (Welding), Mar. 1949, p. 6-8.

Optimum conditions, on the basis of experimental investigation of different methods of welding and different electrodes used.

22D-44. La saldobrasatura delle leghe leggere. (Soldering and Brazing of Light Alloys.) *Alluminio,* v. 18, Mar.-Apr. 1949, p. 161-170.

Recommended procedures for the various common alloys of Al, including design of joints.

22D-45. Welding Applied To Aircraft Construction. G. B. Evans. *Transactions of the Institute of Welding,* v. 12, June 1949, p. 70-75.

Suggests that efforts be made to improve the joining of high-strength, heat treatable, light alloys. 35 ref.

22D-46. Welding With the Aircomatic Process. E. H. Roper. *Welding Journal,* v. 28, Aug. 1949, p. 728-730.

Additional data, including detailed information on welding procedures for aluminum.

22D-47. Argonarc Welding of Aluminum. *Welding,* v. 17, Aug. 1949, p. 324-333.

Methods and equipment; special development work.

22D-48. The Fabrication by Welding of Magnesium Alloys. C. R. Kemp. *Modern Metals,* v. 5, Aug. 1949, p. 31-34.

The alloys used, equipment necessary, metal preparation, the welding process, and hazards.

22D-49. Some Problems in Argon-Shielded Metal-Arc Welding of Thick Aluminum Plate. R. D. Williams, P. L. Mirolo, and C. B. Voldrich. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 59-65.

Five electrical problems: magnitude of the welding current; effect of rectification of the welding current; effect of high-frequency stabilization; effect of open-circuit voltage; and control of wire feed for mechanized welding.

22D-50. Inert-Gas-Shielded Arc Welding of Aluminum. G. O. Hoglund. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 66-72.

Costs, applications and advantages. Equipment and procedures.

22D-51. Recent Advances in Single Phase Welding. Ivar W. Johnson. *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", May 1949, p. 96-101; discussion, p. 102-103.

Spot welding of 24S-T aluminum in thicknesses of 0.025, 0.040, 0.064, and 0.081 in. 52S Al 0.062 in. thick was also welded. Comparative results obtained with and without "slope control", showing great superiority of the latter.

22D-52. Inert-Arc Helps Make Castings. N. D. O'Daniell. *Welding Engineer,* v. 24, Sept. 1949, p. 26-27.

Manufacture of a magnetic device for separating metallic particles from machine-tool coolants. Material used is cast aluminum and five parts are welded together.

22D-53. Der Einfluss der Schweisszeit beim Punktschweissen von Aluminiumlegierungen. (The Effect of Welding Time on the Spot Welding of Aluminum Alloys.) Friedrich Erdmann-Jesnitzer. *Zeitschrift für Metallkunde,* v. 39, Oct. 1948, p. 303-312; discussion, p. 312-313.

Effects of welding time and amperage on strength properties and structures of the welds in six different Al-Mg alloys were determined. Metallographic examination shows that the tendency to cracking and pore formation increases with the Mg and Mn contents of the alloys, while Si has the opposite effect. Results using an improved welding rod. 28 ref.

22D-54. Die Hartlötung von Leichtmetallen unter besonderer Berücksichtigung der Plattierlötung. (Hard-Soldering Light Metals With Special Reference to the "Plate-Soldering" Process.) E. Blohm. *Metall,* Nov. 1948, p. 365-370.

The Zarges "plate-soldering" process for attaching curved sections to flat plates.

22D-55. Heliwelding Aluminum Trailer Roofs. *Iron Age,* v. 164, Sept. 15, 1949, p. 87.

22D-56. Le collage des alliages légers. (Bonding Light Alloys.) (Continued.) Pierre Prévot. *Revue de l'Aluminium,* v. 26, May 1949, p. 163-169; June 1949, p. 209-215.

May: apparent fracture fatigue depends on the joint factor. Chart provides a means of rapid calculation of the resistance of a single lap joint. Fatigue tests show that adhesive-bonded joints have better resistance than the metal alone to alternate stresses and strains; after 5 million alternations, ruptures always occur in the metal. A comparison with riveted or spot welded assemblies indicates the value of bonding for light alloys, especially in the small gages. June: an analysis of advantages and disadvantages of adhesive bonding as compared with other methods. Reviews the principal modern adhesives. (To be continued.)

22D-57. Shear Strength Consistency of Spot Welds in Alclad 24s-T3. J. C. Barrett. *Welding Journal,* v. 28, Sept. 1949, p. 821-831.

For each gage combination of Alclad 24S-T3 there is a shear strength level at which spot welds are most consistent. To obtain this high consistency, values of welding and forge force must be slightly above the threshold at which internal defects disappear. Experimental results.

22D-58. Electrical Problems in Argon-Shielded Arc Welding Thick Aluminum. R. D. Williams, P. L. Mirolo, and C. B. Voldrich. *Welding Journal,* v. 28, Sept. 1949, p. 445s-448s.

See abstract from *American Institute of Electrical Engineers,* "Electric Arc and Resistance Welding", item 22D-49, 1949.

22D-59. New Development Extends Use of Studwelding to Aluminum. J. Bland and V. A. Digiglio. *Materials & Methods,* v. 30, Sept. 1949, p. 78-80.

New end-welding method eliminates drilling and tapping opera-

tions. Many applications in industry are foreseen.

22D-60. Fundamentals in Manual Arc Welding Production Costs. D. M. Kerr. *Transactions of the Institute of Welding*, v. 12, Aug. 1949, p. 88-97.

Methods by which accurate costs may be assessed.

22D-61. Gas Welds in Aluminium-Magnesium Alloy Sheet. J. Pendleton. *Transactions of the Institute of Welding*, v. 12, Aug. 1949, p. 74r-84r.

Experiments to determine the cause and find a remedy for gas porosity in the base metal immediately adjoining the weld.

22D-62. Aluminum Watering Can. John A. Baier. *Welding Engineer*, v. 34, Oct. 1949, p. 70.

Spout and handle are joined to can body at low temperature, using an excess acetylene flame.

22D-63. Tinning Aluminum Sheathed Gables. W. E. Warner. *Railway Mechanical Engineer*, v. 123, Oct. 1949, p. 583.

22D-64. The Welding of Aluminium Alloys; Investigation of Associated Problems. W. I. Pumphrey. *Metallurgia*, v. 40, Sept. 1949, p. 239-245.

Investigations were designed to obtain information regarding factors which affect cracking during welding or casting, in order to permit ultimate formulation of a general theory of the occurrence of cracking, in castings and welds in Al alloys, and on the basis of this theory to suggest suitable methods for preventing or minimizing it, during welding. All welding was effected by means of the oxy-acetylene torch since underlying principles are believed to be the same for both gas and electrical welding. 16 ref.

22D-65. Furnace Brazing Successfully Used on Aluminum Assemblies. A. L. Goldsmith and C. E. Hickman. *Materials & Methods*, v. 20, Oct. 1949, p. 70-72.

By use of proper techniques and brazing alloys, difficulties of joining aluminum were overcome in fabricating refrigerator liners.

22D-66. Heliarc Welding of Aluminum Alloys. Francis H. Stevenson. *Welding Journal*, v. 28, Oct. 1949, p. 971-975.

Recommended procedures. Importance of this process in the metal-spinning industry where the weld metal must withstand the same cold working operation as the base metal.

22D-67. Das Temperaturfeld beim Schweissen eines Leichtmetallbleches der Gattung Al-Mg-Mn. (The Temperature Field in the Welding of Al-Mg-Mn Sheet Metals.) A. Müller-Busse. *Metall*, v. 3, Mar. 1949, p. 71-75.

Theoretical heat transfer on a sheet with a welding time of 30-40 sec. was determined from experimental data and the thermal-expansion coefficient. It was thus possible to draw conclusions on the resulting welding stresses.

22D-68. Stud Welding Speeds Aluminum Roofing Application. *Sheet Metal Worker*, v. 41, Oct. 1949, p. 30-31.

22D-69. Heliarc Welded Aluminum Spools. *Light Metal Age*, v. 7, Oct. 1949, p. 20.

Welding technique.

22D-70. Welded Aluminum Tank Cars. *Industry and Welding*, v. 22, Nov. 1949, p. 24-25.

Picture story shows production sequence from sheet rolling through welding to inspection.

22D-71. New Inert-Arc Process Increases Production. *Industry and Welding*, v. 22, Nov. 1949, p. 36, 38-39.

Case history on use of the new gas-shielded metal-arc process with continuously fed consumable wire for constructing special aluminum vessels (material over ¼ in. thick) on a production basis.

22D-72. Principe d'une méthode d'étude de soudabilité par points pour alliages légers. (Principles of a Method for Study of Spot Weldability of Light Alloys.) P. Borel. *Soudure et Techniques Connexes*, v. 3, July-Aug. 1949, p. 161-171.

Method consists in determination of the variables involved, such as degree of degreasing and pickling, optimum pressure, etc. Methods of determination of the variables and the apparatus used.

22D-73. Dauerhaltbarkeit von Leichtmetall-Nietverbindungen. (Strength of Light-Metal Rivet Joints.) H. Bürnheim. *Zeitschrift des vereines Deutscher Ingenieure*, v. 91, Oct. 1, 1949, p. 504-506.

Factors that help increase the strength of the joints. Test results.

22D-74. New Flash-Welding Techniques. Chas. Bruno and G. W. Birdsall. *Welding Journal*, v. 28, Nov. 1949, p. 1070-1075.

Two new techniques for aluminum. First method somewhat resembles the Vang percussive welding process. Another variation is utilized to practically eliminate flash (excess metal) removal. The latter method is known as miter welding.

22D-75. Aircomatic Process Cuts Time. *Western Machinery and Steel World*, v. 40, Nov. 1949, p. 106, 110.

Use of new welding process in

construction of special aluminum vessels.

22D-76. Le collage des alliages légers. (Bonding Light Alloys.) Pierre Prevot. *Revue de l'Aluminium,* v. 26, Sept. 1949, p. 297-307.

Principal adhesives used in France and abroad. This installment discusses Cycleweld (Chrysler Corp.); Desmodur and Desmophane (Germany); Metlbond (Consolidated Vultee Corp.); Plastilock (Goodrich); Reanit (General Tire and Rubber Co.); Redux (Aero Research, Ltd., and Resinous Products and Chemical Co.); and Araldite (Swiss). Various applications. 42 ref.

22D-77. Warping Eliminated With Heliarc. *Production Engineering & Management,* v. 24, Dec. 1949, p. 66.

Use of Heliarc welding in fabrication of aluminum fuel tanks.

22D-78. Welding Methods Decide Material. *Product Engineering,* v. 20, Dec. 1949, p. 107.

Adoption of Aircomatic semi-automatic welding made practical the use of aluminum for tanks for transportation of printing ink from factory to printing plant. Welding time was reduced from 280 to 48 hr.

22D-79. Welding of Aluminium Alloys: Value of Laboratory Tests. W. I. Pumphrey and D. C. Moore. *Transactions of the Institute of Welding,* v. 12, Oct. 1949, p. 116-124.

Results of laboratory tests for estimating the susceptibility of aluminum alloys to cracking. Test methods and typical results. 12 ref.

22D-80. Réparation des Carrosseries en alliages légers. (Repair of Light-Alloy Automobile Bodies.) Charles Guinard. *Revue de l'Aluminium,* v. 26, Oct. 1949, p. 332-338.

Practical welding and cold forming techniques developed for use on the Al-Mg alloy bodies of Dyna-Panhard automobiles.

22D-81. Manual Argon-Arc Welding of MA-1 Magnesium Alloy. (In Russian.) A. Ya. Brodskii and O. V. Meshkova. *Avtogennoe Delo* (Welding), July 1949, p. 10-12.

Results of experimental investigation (Mn content is 1.3-2.5%). Grain growth was observed in the intermediate zone. Recommended procedures.

22D-82. Causes of Cracking During Welding of Aluminum Alloys. W. I. Pumphrey. *Welding,* v. 17, Dec. 1949, p. 548-552.

Results of investigation; special test apparatus. (To be concluded.)

22D-83. How Giant-Size Aluminum Trays Were Fabricated. *Welding Journal,* v. 28, Dec. 1949, p. 1173.

Hot-water trays, each 22 ft. long, 49.5 in. wide and 6 in. deep; also smaller albumin drying trays and laboratory trays were made to severe specifications. Welds were required to be smooth and free from all pinholes and irregularities.

SECTION XXIII

APPLICATIONS

23A—General

23A-1. These Metals Team up to Chop Plant Costs. *Modern Industry,* v. 16, Dec. 15, 1948, p. 110-112, 114, 116, 118.

Miscellaneous applications of double and triple "sandwiches" of metal—usually known as clad metals, precoated metals, or bimetals.

23A-2. The Story of Copperweld. *Electrical Communication,* v. 25, Dec. 1948, p. 328-333.

"Copperweld" is steel wire with a copper coating poured around and welded securely to it. History of development, how it is made, and where applied.

23A-3. Some Developments in Alloys Containing Nickel. L. B. Pfeil. *Metallurgia,* v. 39, Dec. 1948, p. 81-86.

Developments in new nickel alloys and their applications. 16 ref.

23A-4 (Book). **Bearing Metals and Bearings; A List of Articles Published Between 1942 and 1946.** R. Ruedy. 54 pages. 1946. National Research Council of Canada, Ottawa. (NRC No. 1324).

Lists 332 articles. Includes brief annotations and a very simple subject index.

23A-5. Materials at Work. *Materials & Methods,* v. 29, Mar. 1949, p. 68-70.

An Al-alloy ship superstructure; Ni-plated small-arms ammunition; Mg racks for women's dresses used during cargo-plane shipment; powdered iron lubricating ring in handpliers; other miscellaneous items.

23A-6. Mechanical Features of Steel-Backed Bearings. E. Crankshaw. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 150-164; discussion, p. 205-207.

Mechanical features, methods of fabrication, and applications.

23A-7. Materials at Work. *Materials & Methods,* v. 29, Apr. 1949, p. 68-70.

Rubber-coated oil tank which resists fire and high temperatures; all-welded Al truck body; powdered-bronze machine part; Mo seamless tube (experimental product); glass bearing (demonstration unit); Ni-Cr-Mo steel axles; nylon commutator-segment washers; and phenolic chuck jaws which eliminate marring.

23A-8. (Book.) **Sleeve Bearing Materials.** R. W. Dayton, editor. 256 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio.

A series of educational lectures. Individual papers abstracted separately.

23A-9. Litho Ovens Speed Can Production. Arthur Q. Smith. *Industrial Gas,* v. 27, Apr. 1949, p. 3-5.

Gas-fired coating and lithographing drying ovens.

23A-10. Hard Facing: New Armor for Cold War on Costs. *Modern Industry,* v. 17, Apr. 15, 1949, p. 50-53.

Miscellaneous applications of improved methods for laying a hard metallic surface over a not-so-hard base metal.

23A-11. Pneumatic Sander Employs Magnesium Housing and Alloy Steel Working Parts, for Light Weight and High Capacity. C. N. Douglass. *Machine Design,* v. 21, May 1949, p. 103-106.

23A-12. Materials at Work. *Materials & Methods,* v. 29, May 1949, p. 68-70.

Welded aluminum cans; all-brass combination window; cored steel agitator blades; transparent plastic oil cup; flexible steel folding rule; plastic television cabinet; molded-on plastic handles; and nylon spray-gun valve.

23A-13. Ceramal: New Turbine Blade Alloy. *Aviation Week,* v. 50, May 23, 1949, p. 26-27.

Early research. Properties and use of ceramal, a combination of ceramics and metals, as a heat resistant material.

23A-14. Nonslip Materials Find Wide Use in Industry. T. C. Du Mond. *Materials & Methods,* v. 29, June 1949, p. 59-61.
Properties and applications of a wide range of special low-friction materials, both metallic and nonmetallic, for use as walkway surfaces.

23A-15. Materials at Work. *Materials & Methods,* v. 29, June 1949, p. 62-63.
Welded shovel dipper; molded-glass machine parts; transparent acrylic antenna domes; ethyl cellulose roller printer; alloy-steel cylinders; and Al-alloy hoist.

23A-16. Betrachtungen uber den Wärmeverbrauch von Kochgeschirren. (Observations on the Heat Consumption of Cooking Utensils.) Hans J. Karmaus. *Metalloberfläche,* ser. A, v. 3, May 1949, p. 111-114.
A study of the thermal efficiency of cooking utensils made of different materials and with different internal and external surface treatments.

23A-17. Metals for High Temperature Service. Ward F. Simmons and A. B. Westerman. *Metals Review,* v. 22, June 1949, p. 5-9.
Reviews the past year's literature in some detail, but also includes a few of the outstanding references appearing between 1945 and 1948. Information on welding, structure, and oxidation characteristics, also on the "ceramals" (powdered ceramic-metal compositions).

23A-18. Selecting the Closure Liner. Tracy Cowen. *Modern Packaging,* v. 22, June 1949, p. 149-152.
Available materials, including metallic foils, laminated films, varnish and resin coatings, calendered coatings, wax coatings, and miscellaneous liners or sealing materials. Liner backings and need for a universal liner.

23A-19. High-Temperature Materials for Aircraft Power Plants. R. A. Jones. *Technical Data Digest,* v. 14, July 1, 1949, p. 15-21.
Increased requirement for high efficiencies. Better design and temperature distribution and use of special cooling provisions, ceramic-coated metals, metal-ceramic materails, and ceramic materials.

23A-20. Materials Section. *Electronics,* v. 22, Buyers' Guide Issue, mid-June 1949, p. M1-M32.
Tabulates important electrical, mechanical, and other significant characteristics of most raw materials used by the electronics industry, for convenient use by designers of component parts, housings, and complete equipment.

23A-21. Materials at Work. *Materials & Methods,* v. 30, July 1949, p. 66-67.
Steel betatron magnet core; stainless-steel orchard heater; brazing aluminum by means of a special-purpose automatic gas-fired machine; rubber vibration dampener; glass fiber-reinforced vaporizer; and rubber-covered steel container for use in handling acids, alkalis and other corrosive solutions.

23A-22. Heat-Resistant Alloys for Aviation. F. S. Boericke. *Aero Digest,* v. 59, Aug. 1949, p. 43-45.
With emphasis on those produced by Haynes Stellite Co.

23A-23. Materials in the Aircraft Industry. Clyde Williams. *Materials & Methods,* v. 30, Aug. 1949, p. 51-54.
Present knowledge of structural materials for aircraft, major gaps in that information being indicated. Possible new materials for aircraft of the future, and finally some factors, other than purely technological ones, which influence the choice of materials.

23A-24. Materials at Work. *Materials & Methods,* v. 30, Aug. 1949, p. 66-68.
High-strength steel trailer, transparent plastic carburetors, plastic shaver housing, aluminum and plastic sander, bonded silicone rubber for high-pressure gasket and diaphragm applications, corrosion-resistant air valve, and all-aluminum inboard runabout.

23A-25. Metals in Clock and Instrument Manufacture. R. E. Tricker. *Journal of the Institute of Metals,* v. 75, July 1949, p. 881-898.
The various ferrous and nonferrous alloys used for turned parts, die castings, pressed and blanked parts, spring materials, magnet alloys, and alloys with special applications.

23A-26. Expanded Metal Growing in Popularity. *Sheet Metal Worker,* v. 40, Aug. 1949, p. 48-50.
Wide variety of applications of expanded metal, which is essentially heavy-gage screening with a diamond-shaped pattern made by slitting ordinary sheet metal, then stretching it so the slits become diamond-shaped holes.

23A-27. Magnetic Fluid Uses. *Electronics,* v. 22, Sept. 1949, p. 120, 122, 158, 160, 162, 164, 166.
Recent studies of iron-oil mixtures used in the electromagnetic fluid clutch developed by the National Bureau of Standards reveal that magnetic fluids can be employed to good advantage in hydraulic systems,

shock absorbers, and dash pots, to form casting molds and as variable electrical resistors.

23A-28. Sleeve Bearing Development. Albert B. Willi, Jr. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 68-73; discussion, p. 73-74.

Recent developments in bearing lining and backing materials, bearing material combinations, and manufacturing methods. Relative bearing costs, typical installations, and average bearing life.

23A-29. Choice of Materials Helps Achieve Remarkable Weight Reduction in ACF Talgo Train. T. C. Du Mond. *Materials & Methods,* v. 30, Sept. 1949, p. 57-60.

Materials selected for new train permitted designers to reduce weight by 75% over standard trains and lower center of gravity by 4 ft. Weight is reduced by the use of Al for all of the coaches, with the exception of the undercarriages; lightweight, high-strength steel castings for load-bearing members; and liberal use of aluminum-plywood sandwich materials.

23A-30. Materials at Work. *Materials & Methods,* v. 30, Sept. 1949, p. 68-69.

Bimetallic fishing-reel brake; steel tube cylinders for automotive shock absorbers; die-cast Al automobile door.

23A-31. Bearings. H. W. Greenwood. *Machinery Lloyd* (Overseas Edition), v. 21, Aug. 27, 1949, p. 103, 105.

Applications and advantages of powdered metals.

23A-32. Spools for Shipping Magnet Wire. F. A. Rappleyea. *Wire and Wire Products,* v. 24, Oct. 1949, p. 886-887, 890, 973-975.

Factors to be considered in choice of design and material. Data on properties of plywood, carbon steel, aluminum, magnesium, and fibreglass; also test results from winding and pull tests on seven different spool types (variation in design and materials).

23A-33. Materials at Work. *Materials & Methods,* v. 30, Oct. 1949, p. 80-82.

New applications include Al-Mg bottle carrier, Al oil cooler, brass-Al-stainless kerosene stove, glass-Kovar waveguide windows, and cemented-carbide quench blocks to assure correct tempering of razor-blade stock as well as to reduce scrap and the necessity of constant block renewal.

23A-34. The Increasing Uses of Powdered Metal Parts. Joseph Geschelin. *Automotive Industries,* v. 101, Nov. 1, 1949, p. 27, 64, 67.

Use of "Oilite" bearings and finished parts.

23A-35. Strebausbau in Metall. (Metal Props.) O. Kuhn. *Zeitschrift des vereines Deutscher Ingenieure,* v. 91, Sept. 1, 1949, p. 425-430.

Use of adjustable steel and light-metal roof supports (props) in German anthracite mines. Need for further research.

23A-36. Orientamenti attuali circa la costruzione dei conduttori per le grandi linee di interconnessione internazionali e nazionali. (Present Trends in the Manufacture of Electrical Conductors for Long-Distance International and National Lines.) *Alluminio,* v. 18, June 1949, p. 241-253.

Present trend toward voltages above 220,000, and the construction and properties of conductors suitable for such voltages, especially those of aluminum-steel combinations. Advantages and disadvantages on the basis of a survey of Italy, France, Germany, Sweden, the U. S., and Canada.

23A-37. Kolloidchemisch interessante Metalle und anorganische Metallverbindungen. (Metals and Inorganic Metal Compounds of Interest From the Standpoint of Colloid Chemistry.) II. Bruno Waeser. *Kolloid Zeitschrift,* v. 113, June 1949, p. 180-192.

Patents on the chemical and metallurgical uses of the industrially more important metals and compounds.

23A-38. How To Select Materials for Plastic Mold Cavities. L. J. Morrison. *Materials & Methods,* v. 30, Nov. 1949, p. 61-63.

Wide variety of mold materials now available and choice of the most economical one for a given application.

23A-39. Materials at Work. *Materials & Methods,* v. 30, Nov. 1949, p. 66-68.

Steel-tube TV antenna; corrosion resistant air valve; synthetic-fiber and wool filter; high-strength steel skids; magnesium gangplank; diaphragm-type fuel pump; and rubber "zipper" belts.

23A-40. Metal Containers in the Food Packing Industry. R. K. Sanders. *Research,* v. 2, Nov. 1949, p. 519-523.

Research on the above, confined to tin plate, black plate, Al, or Al alloys. Corrosion and leakage problems, the latter usually caused by defective soldered seams. 10 ref.

23A-41. Welded Fabrications in Corrosion Resistant Materials Give Engineers Great Latitude in Design of Industrial Equipment. R. J. Tierney. *Steel,* v. 125, Dec. 5, 1949, p. 92-93, 130.

A few examples of how corrosion

resistant materials can be welded to cheaper metals in order to provide protection yet minimize over-all costs.

23A-42. Bimetallic Shears Have Replaceable Blades. *Product Engineering,* v. 20, Dec. 1949, p. 104.

The best properties of aluminum and steel are utilized in the design of pinking shears. The lightweight handles are of forged aluminum; but the actual cutting is done by a pair of cutlery steel inserts. All four pieces are held in place by a single hinge bolt.

23A-43. Metals Used in Clock and Instrument Manufacture. R. E. Tricker. *Engineering,* v. 168, Nov. 18, 1949, p. 543-546. A condensation.

Previously abstracted from *Journal of the Institute of Metals.* See item 23A-25, 1949.

23A-44. Wire Parts in Clocks and Instruments; Characteristics Described. *Wire Industry,* v. 16, Nov. 1949, p. 903, 905. Based on "Metals in Clocks and Instrument Manufacture", R. E. Tricker.

Previously abstracted from *Journal of the Institute of Metals.* See item 23A-25, 1949.

23A-45. High Corrosion Resistance Gives Nickel Plated Metals Wide Range of Uses. W. H. Prine. *Materials & Methods,* v. 30, Dec. 1949, p. 43-46.

Varied industrial applications where service conditions do not justify use of solid corrosion resistant materials.

23A-46. Materials at Work. *Materials & Methods,* v. 30, Dec. 1949, p. 64-66.

Al-finned radiator; plastic air precleaner; alloy pen nibs (Co-Ni-Cr-Mo-Mn-Fe-Be-C); plastic pharmaceutical trays; steel and rubber lathe collet for increased gripping power; multi-purpose garden tool, Mg grain shovels, and plastic textile-machine component.

23A-47. Weldable Stainless-Clad Copper Offers Material Economies in Many Applications. L. W. Townsend. *Steel,* v. 125, Dec. 19, 1949, p. 80-81, 104.

Combining heat conducting properties of copper with corrosion resistance and other qualities of stainless steel, new composite material has wide use in food and chemical processing, refrigeration, utensil, appliance, and aviation industries. Production methods and equipment.

23B—Ferrous

23B-1. Wire Ropes; Mining and Engineering. Richard Saxton. *Canadian Mining Journal,* v. 69, Dec. 1948, p. 75-76.

Various designs; their relative serviceabilities, and recommendations for use.

23B-2. Glass-Enamelled Steel Equipment for the Chemical Industry. J. M. Pirie. *Proceedings of the Chemical Engineering Group, Society of Chemical Industry,* v. 26, 1944, p. 155-160.

Nature of the vitreous lining, design, construction, and uses.

23B-3. Selection of Materials for Plastic Molds. L. J. Morrison. *Machinery* (American), v. 55, Jan. 1949, p. 180-182. A condensation.

Properties and suitabilities of various steels for the different types of plastic-molding jobs.

23B-4. Tool Steels. D. J. Giles and F. B. Foley. *American Iron and Steel Institute,* 1949, 10 pages.

The various types, their methods of manufacture, properties, and applications.

23B-5. Recent Advances in Alloy and Special Steels. D. A. Oliver. *Metallurgia,* v. 39, Dec. 1948, p. 71-74.

Advances in low-alloy engineering constructional steels, steels for use at elevated temperatures, gas-turbine steels, toolsteels, and materials for permanent magnets. Not exhaustive, but indicative of general progress. 15 ref.

23B-6. Alloys for Heat Treating Equipment. Hugo W. Hiemke. *Western Metals,* v. 7, Jan. 1949, p. 27-29.

Development and properties of Ni-Cr steels, which resist scaling and carburization, for use in equipment and fixtures used for high-temperature hardening operations.

23B-7. Materials Used in Steam Turbine Rotor Forgings. C. Sykes. *West of Scotland Iron and Steel Institute,* 1947, 45 pages.

Types of steel used, their properties and methods of manufacture and inspection.

23B-8. How Durable is Porcelain Enameled Roofing? *Enamelist,* v. 26, Jan. 1949, p. 29-30, 68.

The answer given is that a 17-year test on a gas-station roof shows no change.

23B-9. La technique de l'emploi simultané de l'acier coulé et du soudage en construction mixte. (The Technique of Simultaneous Application of Cast Steel and Welding in Compound Structures.) Henri Gerbeaux. *Fonderie,* Oct. 1948, p. 1335-1353.

Use of cast steel and welding for the production of a series of implements, such as machine parts, railroad equipment, hydraulic installations. Such applications re-

quire the development of special steels.

23B-10. Steel Conservation in Lightweight Freight Cars. Marvin Barloon. *Iron Age,* v. 163, Feb. 3, 1949, p. 102-109.

Construction of freight cars of low-alloy lightweight steels is urged as a means of permitting an urgently needed increase in car output without increasing steel needs above present tonnages. Examines the more common objections to this type of construction and attempts to refute them.

23B-11. Circular Saws; Problems in the Design, Manufacture, and Operation of Standard Saws for All-Purpose Work. R. D. Brooks. *Mechanical Engineering,* v. 71, Feb. 1949, p. 133-138.

23B-12. How to Select Materials for Plastic Molds. L. J. Morrison. *Steel,* v. 124, Feb. 14, 1949, p. 110, 112, 114, 116, 118, 120, 123.

See abstract from *Machinery* (American), item 23B-3, 1949.

23B-13. The Use of Stainless Steel in the Chemical and Food-Processing Industries. J. A. McWilliam. *Murex Review,* v. 1, no. 1, 1948, p. 1-11.

23B-14. Research Report: Construction With Light Steel. B. L. Wood. *Progressive Architecture,* v. 30, Mar. 1949, p. 74-78.

New developments in dwelling and other construction.

23B-15. New Cold Finished Carbon Steel Bars Replace Higher Cost Alloy Steels. *Machine and Tool Blue Book,* v. 45, Mar. 1949, p. 172-174.

Commercial use of "Electreat" cold finished carbon steel bars to replace higher cost alloy steels.

23B-16. Hard Chrome Has Its Uses. Arthur Logozzo. *American Machinist,* v. 93, Mar. 10, 1949, p. 85-87.

Although hard chromium plating was oversold during World War II, postwar experiences have justified it for specific applications.

23B-17. Treated Carbon Steel Substituted for Alloy in Studs. *American Machinist,* v. 93, Mar. 24, 1949, p. 99.

Used in the manufacture of certain studs for automotive and farm machinery, the above substitution has eliminated heat treating after machining. Studs have greater uniformity and smoother finish combined with a lower operating cost.

23B-18. Notes on Stainless Steel. *Sheet Metal Worker,* v. 40, Mar. 1949, p. 43, 73.

Properties and applications. Hints on fabrication procedures.

23B-19. Selection and Heat Treatment of Cutting Tools. Norman I. Stotz. *Metal Progress,* v. 55, Apr. 1949, p. 484-489.

Recommendations on how to avoid troubles in cutting tools arising from improper selection of type and careless heat treatment. Significance of hot hardness and relation of structure to performance.

23B-20. High-Speed Production of Metal Kinescopes. H. P. Steier and R. D. Faulkner. *Electronics,* v. 22, May 1949, p. 81-83.

New techniques employed in the manufacture of 16-in. and other television-receiver picture tubes which reduce their cost. Single-platform tilting tables have been replaced by a series of continuous settling belts. Metal used was selected on the basis of its glass-sealing properties. It is a modified high-Cr SAE 446 alloy.

23B-21. Glass-Lined Steel Equipment. O. I. Chormann. "Engineering Laminates" (John Wiley & Sons, 1949), p. 573-582.

Types of steel suitable, fabrication methods (forming, welding, and cleaning), chemical durability of the glasses used, and applications.

23B-22. (Book) **A History of Cast Iron in Architecture.** John Gloag and Derek Bridgwater. George Allen and Unwin, Ltd., 40, Museum-Street, London, W.C.1, England. 63s. net.

The history of cast iron as a material for the construction and decoration of buildings, with sidelights on the development of the iron industry and the use of iron as a material for engineering purposes. Illustrated with over 500 photographs and reproductions of drawings and six colored plates.

23B-23. Notes on the Uses of Stainless Steels in the Petroleum Industry. Paul L. Weinman. *American Society of Mechanical Engineers,* Preprint, 1948, 13 pages.

23B-24. Materials Used in Steam Turbine Rotor Forgings. C. Sykes. *Journal of the West of Scotland Iron and Steel Institute,* v. 55, 1947-48, p. 11-23; discussion, p. 23-45.

Types of steel used in rotor forgings, their properties, and methods of manufacture and inspection.

23B-25. Less Truck Weight With High-Strength Steel. *Automotive Industries,* v. 100, June 1, 1949, p. 39, 60.

Economical use of high-strength steel to reduce weight, improve rust-resistance, and withstand abrasive wear in light truck bodies.

23B-26. New Alloy Steel Increases Service Life of Plastics and Die-Cast Mold Bases. *Vancoram Review,* v. 6, no. 1, [1948], p. 10.

23B-27. Talgo Train Makes Extensive Use of Alloy Steel Castings. *Iron Age,* v. 163, June 9, 1949, p. 58-59.
Castings used.

23B-28. A Review of the Properties of Magnetic Sheet Steel and Its Use in Engineering. D. Edmundson. *Sheet Metal Industries,* v. 26, June 1949, p. 1199-1204, 1214.

23B-29. Tests Scheduled Soon on Stainless Steel Coal Conveyor Belts. George F. Sullivan. *Iron Age,* v. 163, June 16, 1949, p. 133-134.
New development which may open up a 2500-ton a year market for stainless-steel strip and also cut coal-mining costs. Some problems remain to be solved.

23B-30. Quick, Watson, the Alloy! E. C. K. Read. *Steelways,* v. 5, May 1949, p. 28-31.
Type and requirements of steel alloys for various applications — fenders, pipes, rails.

23B-31. Improved Coke Quenching Car Built by Bethlehem Steel. *Industrial Heating,* v. 16, June 1949, p. 1082, 1084.
Use of car with an air conditioned cab, built almost entirely of Mayari R low-alloy, high-strength steel.

23B-32. Shineless Stainless Steel. Ann E. Ewing. *Science News Letter,* v. 55, June 18, 1949, p. 394-395.
Black rustless steel and its applications both for military purposes, where its unreflecting surface affords safety against the enemy, and for jewelry.

23B-33. Alloy-Steel Bits Tested at Morenci. L. Ormsby. *Mining Engineering,* v. 1, sec. 1, July 1949, p. 30.
Tests on the above used in open pit mining.

23B-34. Power Plant Operates at 1050° F. *Iron Age,* v. 163, June 30, 1949, p. 64.
Use of high-temperature steels in the new Sewaren, N. J., steam power station of Public Service Electric and Gas Co., which has made it possible to generate power at low cost by operating at a steam temperature 50° F. higher than any other power-plant installation in the world.

23B-35. Mild Steel in Ship Construction. W. Barr and A. J. K. Honeyman. *Transactions of the Institution of Engineers & Shipbuilders in Scotland,* v. 92, Dec. 1948, p. 73-106; discussion, p. 107-112, also Jan. 1949, p. 113-121.
An extensive discussion beginning with historical development of use of steel instead of wrought iron. Reviews recent work on brittle fracture of welded ships. Charpy and Izod impact-test machines and their use; effects of production variables: deoxidation, rolling, heat treatment, and composition; application of quench or precipitation aging and strain aging; effects of variations in test conditions; effects of welding; and effects of design changes. Practical recommendations. 26 ref.

23B-36. Metals Used in Oil Refining; Comparative Resistance to Heat, Stress and Oxidation. W. I. Pumphrey. *Chemical Age,* v. 60, June 11, 1949, p. 853-856.
A general discussion. 13 ref.

23B-37. Fabrication des corps broyants de cimenterie. (Production of Grinding Media for Cement Mills.) Henry Gernelle. *Fonderie,* Mar. 1949, p. 1521-1524.
Establishes the main qualities required by grinding balls for ball mills. A series of different steels for this use are proposed on the basis of production experience. Optimum compositions of balls for different types of mills.

23B-38. Sonderstähle und Legierungen fur hohe Temperatur. (Special Steels and Alloys for High Temperatures.) E. Siebel and N. Ludwig. *Konstruktion,* v. 1, No. 1, 1949, p. 13-26.
The most suitable steels for construction of steam engines, turbines, and boilers were investigated by study of their creep-stress, corrosion, and scaling resistances and permanent expansions at elevated temperatures. Special attention is given to effect of alloy additions on high-temperature properties. 36 ref.

23B-39. Stainless Steel in Bridge Bearings. Frank M. Masters. *Metal Progress,* v. 56, July 1949, p. 80.
Use of 18-8 stainless, first tried in 1937. These bearings are still in perfect condition.

23B-40. Industrial Use of Modified Armor-Plate Steel. A. F. Busick, Jr. *Welding Journal,* v. 28, July 1949, p. 651-659.
Uses in power excavators used for strip mining of coal. New designs and selection of welding electrodes and procedures.

23B-41. Steel Finds New Market: RBM Building. Thomas A. Dickinson. *Western Metals,* v. 7, July 1949, p. 22-23.
New type of building construction known as "RBM" (Reinforced Brick Masonry). Structural steel

reinforcing is incorporated by the bricklayers to produce earthquake-proof structures.

23B-42. Materials for Moulds. Part I. L. Sanderson. *British Plastics,* v. 21, July 1949, p. 405-407.

Various steels used for plastics molds, their properties, advantages, and disadvantages.

23B-43. Selection of Steel for Automobile Parts; What Engineers Should Know Today About Hardenability-Band Steels. Part I. Introduction to Hardenability. Joseph Geschelin. *SAE Journal,* v. 57, Aug. 1949, p. 17.

First of a six-part report issued by the SAE Iron and Steel Technical Committee. Succeeding installments were prepared by A. L. Boegehold.

23B-44. High-Strength Steel Today. E. K. Waldschmidt. *Coal Age,* v. 54, Aug. 1949, p. 95-97.

Use in the manufacture of mining, haulage and transportation equipment.

23B-45. Steel Buildings Speed Western Plant Expansions. *Western Metals,* v. 7, Aug. 1949, p. 19-21.

23B-46. Characteristics of the Materials Involved in the Magnetic Fluid Clutch. H. D. Saunderson. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 93-101; discussion, p. 102, 106.

Properties and applicabilities of the metallic powders, the fluids, and the surface-active agents used as the power-transmitting media in the clutches. Includes photomicrographs of carbonyl iron powders dispersed in mineral oil, magnetically aligned and free moving. Applications of the clutches.

23B-47. Light-Gage Steel Offers New Building Opportunities. B. L. Wood. *Engineering News-Record,* v. 143, Sept. 1, 1949, p. 203-205.

Several applications. Design principles.

23B-48. Some Notes on the Use of Heat-Resisting Steel Refractories on Glass Works. H. M. Bateson. *Journal of the Society of Glass Technology* (News and Reviews Section), v. 33, Apr. 1949, p. 75.

Possible applications of steel refractories for certain parts which come in contact with molten glass, as a substitute for the refractory materials generally used. The slight extra cost is more than compensated for by increased life and strength. Steel feeder needles, orifice rings, and forehearth cover tiles have given good service.

23B-49. Construction Materials for High-Pressure Equipment. A. G. Harding. *Chemical Engineering,* v. 56, Sept. 1949, p. 116-117.

Equipment for the new Bureau of Mines coal-hydrogenation plant.

23B-50. Stainless Steel Moves Into Nitric Acid Container Business. *Chemical Engineering,* v. 56, Sept. 1949, p. 175.

New use.

23B-51. Steel in Shipbuilding. J. Lomas. *Engineers' Digest,* v. 10, Aug. 1949, p. 271-273.

Applications of various types.

23B-52. Tool Steels; The Development of New Types. H. Carr. *Iron and Steel,* v. 22, Sept. 1949, p. 413-416.

Object of this survey is to draw to the attention of toolsteel users some new types of steels and to suggest to toolsteel manufacturers possible fields of research. Includes sections on high speed steel, hot die steels, air-hardening cold work steels, graphitic steels, cold hobbing steels, glass-molding steels, and tungsten carbide.

23B-53. The Man Who Rebuilds People. *Steelways,* v. 5, Sept. 1949, p. 10-12.

Work of "surgeon-metallurgist" in replacing human bones with stainless steel.

23B-54. Graphitic Toolsteel. Edgar C. Wallace. *Metal Progress,* v. 56, Oct. 1949, p. 512.

Substitution for 18-4-1 high speed steel in the manufacture of lathe, sharpening, and grinding arbors.

23B-55. Increased Use of Hard Carbides for Wear Resistance. J. S. Gillespie. *Metal Progress,* v. 56, Oct. 1949, p. 523-526.

Use in connection with grinding equipment.

23B-56. The West Builds With Steel. *Western Metals,* v. 7, Sept. 1949, p. 27-29.

Steel construction by companies which do prefabrication and design work. Code requirements.

23B-57. General-Purpose Steel for Machining and Hobbing. *Modern Plastics,* v. 27, Oct. 1949, p. 105, 108-109.

Selection of steels for constructing molds, testing hobbing qualities, and specific uses.

23B-58. Plastic Product and Mold Design. John J. Johnescu. *Machinery,* v. 56, Oct. 1949, p. 182-189.

Part tolerances, mold steels, and principles of plastic-product design recommended by Westinghouse Electric Corp.

23B-59. The Story of Stainless Steel Strand. V. H. Godfrey. *Electric Light and Power,* v. 27, Oct. 1949, p. 82-84, 147.

Corrosion resistant and mechanical properties of stainless steel wire which have made its use for messenger, shield, and guy-wire applications economically justified through elimination of maintenance and replacement expense.

23B-60. How Stainless Steel Improves Screening Results. Charles G. Purnell. *Coal Age,* v. 54, Nov. 1949, p. 88-90.

Superiority of stainless steel for screens in refuse shakers, dewatering and desanding units, wet-sizing tables, air-cleaning tables, and chemical-treatment systems.

23B-61. Bergborrning med hardmetallskär. (Rock Drilling With Hard-Metal Tipped Steel Tools.) T. Ekstam, K. H. Fraenkel, and E. Ryd. *Jernkontorets Annaler,* v. 133, no. 8, 1949, p. 253-286; discussion, p. 286-298; English summary, p. 298-299.

Procedure for collection of data on length of life and failures of tools. Comparative figures have been established for drilling resistance of various types of rock. Effect of size of drill on durability.

23B-62. Modern Boiler and Firebox Steel. *Railway Mechanical Engineer,* v. 123, Nov. 1949, p. 640-642.

Properties of different compositions, and effect of residual stresses on boiler failures.

23B-63. Aciers ferritiques pour turbines à gaz. Étude de l'acier HGT3 à 3% Cr-Mo-W-V. (Ferritic Steels for Gas Turbines. Study of HGT3 Cr-Mo-W-V Steel Containing 3% Cr.) (Concluded.) G. Wood and J. R. Rait. *Revue de Métallurgie,* v. 46, July 1949, p. 463-474; discussion, p. 474.

Production of the steel; optimum conditions of heat treatment; mechanical properties. Paths of future development of heat-resistant Cr steels containing different alloying elements are indicated.

23B-64. Stainless Tubing Cuts Cost of Cooker Fitting. *Product Engineering,* v. 20, Dec. 1949, p. 104.

Substitution of more expensive stainless steel tubing for stainless sheet lowered production costs on pressure-cooker handle because elimination of annealing operations, faster production, and fewer rejects more than offset increased cost of tubing.

23B-65. Beitrag zur Entwicklung und zum Stand der Temperguss-Transportketten. (The Development and Status of Malleable-Iron Conveyer Chains.) Franz Roll. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Oct. 1949, p. 314-322.

Various types, their respective suitability and uses; methods of production; mechanical, chemical, and thermal wear; surface treatment; metallographic structures and defects; design; and tensile testing.

23C—Nonferrous

23C-1. Sintered Plates for Nickel-Cadmium Batteries. Arthur Fleischer. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 289-299.

Porous plaques are prepared by sintering nickel carbonyl powder of low apparent density. The plaques are impregnated with Ni or Cd salt solutions and the heavy metal ions precipitated in the pores of the plaque by cathodic polarization in alkali hydroxide solution. A typical set of discharge curves is shown for a 5-plate experimental cell. 20 ref.

23C-2. Magnetic Escapements for Pendulum Clocks. *Nickel Bulletin,* v. 21, Oct. 1948, p. 138-141.

Application of Ni-Fe magnet alloys.

23C-3. Erfahrungen mit Goldplatin als Werkstoff fur Laboratoriumsgeräte. (Experiences With a Gold-Platinum Alloy as a Material for Laboratory Instruments.) K. W. Frohlich. *Angewandte Chemie,* sec. B, v. 20, Mar. 1948, p. 72.

Compares Au-Pt alloy with pure platinum with respect to properties important in the laboratory. Resistance to attack by various chemical reagents at elevated temperatures.

23C-4. New Outdoor Air Switch. S. C. Killian. *Electrical Engineering,* v. 68, Jan. 1949, p. 47. Condensed from "A New Outdoor Air Switch and a New Concept of Contact Performance." (To be published in *AIEE Transactions,* v. 67, 1948.)

The blade is a one-piece hard drawn copper tube which rotates about its own axis to release contact pressure before lifting. Heavy beryllium-copper springs provide contact pressure and are independent of the hard-drawn copper shoes which carry silver inlays. This combination was chosen after a long program of contact-abrasion testing on many materials. Efficiency after oxide and sulphide film formation was determined for a series of bimetal combinations.

23C-5. How Small Is a Die Casting? *Die Casting,* v. 7, Jan. 1949, p. 26-28, 60-62.

Use of new machines and techniques makes it practical to produce die castings of almost unlimited smallness and high precision.

23C-6. Electronic Applications of Ger-

manium. *Nature,* v. 162, Dec. 25, 1948, p. 982-983.

23C-7. Zinc-Metal Alloys and Pigments; Progress Review, 1947-1948. B. Walters. *Metallurgia,* v. 39, Dec. 1948, p. 86-90.

12 references.

23C-8. Aluminium Conduit and Accessories. J. L. Simpson. *Light Metals,* v. 12, Jan. 1949, p. 38-42.

Use and advantages of the above and reasons for the development of zinc-base accessories.

23C-9. The Telecommunications Industry. Some Metallurgical Problems of Materials and Maintenance. E. Mills. *Sheet Metal Industries,* v. 25, July 1948, p. 1369-1382.

Factors influencing choice of materials, and properties and applications of the various broad groups of metals and alloys. Factors are space, wear, and corrosion. Applications include cable alloys, contacts, and contact materials. Light alloys, copper, brasses, phosphor bronzes, and nickel silver are discussed.

23C-10. The Use of Zinc-Alloy Diecastings in the Code Lock. H. K. Barton. *Machinery* (London), v. 74, Jan. 27, 1949, p. 114-117.

23C-11. Copper-Base Alloys for Springs. I. Harold C. R. Carlson. *Product Engineering,* v. 20, Feb. 1949, p. 103-107.

Theory of corrosion and causes of galvanic corrosion and stress-corrosion cracking. Gages and temper hardnesses in which Cu-base alloy wire and strip are available. Workability and joining methods.

23C-12. Solving Corrosion Problems With Lead and Tin Die Castings. *Die Castings,* v. 7, Feb. 1949, p. 22-23, 68-70.

Use for various parts of label pasters which come in contact with liquid adhesives.

23C-13. Catalysts From Alloys of Nickel and Non-Catalytic Metals. W. J. Kirkpatrick. *International Nickel Co.,* Industrial Fellowship No. 306, 1948, 29 pages.

Reviews the literature on preparation and properties of alloys, preparation of catalyst by removal of noncatalytic metal from the alloy, lump catalyst for continuous processes, and properties of catalysts.

23C-14. (Book). **The Science of Dental Materials.** Ed. 3, revised. Eugene W. Skinner. 410 pages. 1946. W. B. Saunders Co., Philadelphia.

Physical and chemical properties and principles involved in application and manipulation of gold and its alloys, dental amalgams, zinc phosphate, copper, cements, gypsum products, waxes, plastics, porcelain, and abrasives.

23C-15 (Book). **Copper Flashings and Weatherings.** 105 pages. 1948. Copper Development Association, Grand Buildings, Trafalgar Square, London, W. C. 2, England.

A handbook giving practical details for using copper sheet and strip. Specifications and properties.

23C-16. Platinum Metals 1948 Review. Charles Engelhard. *Canadian Metals and Metallurgical Industries,* v. 12, Feb. 1949, p. 42.

Applications of Pt, Pd, Rh, Ru, Ir, and Os.

23C-17. Lock Design Features Zinc Diecastings. *Iron Age,* v. 163, Feb. 24, 1949, p. 77.

New heavy-duty tubular lock contains 20 zinc die-cast parts.

23C-18. Copper-Base Alloys for Springs. II. Harold C. R. Carlson. *Product Engineering,* v. 20, Mar. 1949, p. 86-91.

Mechanical properties of spring-brass, phosphor-bronze, Be-Cu, and other Cu-base alloy wire and strip stock for springs. Improved properties derived from cold work and heat treatments. Field of application of each alloy in mechanical and electrical products.

23C-19. Cadmium vs. Lead Batteries. D. H. Kelly. *Metals,* v. 19, Mar. 1949, p. 7-8, 14.

Refutes claims of recent *Popular Science Monthly* and *Reader's Digest* article which stated that Europeans are 40 years ahead of the U. S. with their superior cadmium batteries. Claims that cadmium batteries are actually inferior to the lead type, and are not widely used even in Europe.

23C-20. Copper in Electronic Tubes. R. Carson Dalzell. *Electronics,* v. 22, Apr. 1949, p. 164-170.

Properties required for this use; properties of the different commercial types; types of glass-copper seals; and miscellaneous fabrication methods.

23C-21. British Thought and Practice; How They Differ From American. W. H. Tait. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 35-55; discussion, p. 55-58.

Various differences believed mainly due to the American tendency to demand less long-term serviceability as opposed to lower costs and greater speeds of production.

23C-22. Newer Bearing Materials. I. C. Sleight and L. W. Sink. *American Society for Metals,* "Sleeve Bearing Ma-

terials," 1949, p. 60-81; discussion, p. 136-137.

Three general classes—silver, aluminum, and grid bearings. Design, bearing requirements, manufacturing processes, and properties.

23C-23. Discussion of Wrought (or Rolled) Bushings and Bushing Materials. Harry P. Croft, E. G. Mitchell, Verne Hoover, and John K. Anthony. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 140-145.

Reasons why wrought (or rolled) bushing materials are used extensively in many and varied applications in preference to sand castings. Production methods, structures, properties, and compositions of seven alloys of this type.

23C-24. Aircraft Engine Bearings. J. Palsulich and R. W. Blair. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 223-234.

The type of bearing materials used in aircraft engines and the methods of inspection used to insure the highest quality. Mechanical and corrosion tests to which new materials are subjected, and successful design practices.

23C-25. Selection of Bearing Materials in the Electrical Industry. D. F. Wilcock. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 235-240.

Principles to be considered with regard to bearings for instruments, switchgear, fractional horsepower motors, integral horsepower motors, and turbines, generators and gears.

23C-26. Brass and Bronze for Electrical Springs. Arthur I. Heim. *Electrical Manufacturing,* v. 43, Apr. 1949, p. 114-117, 204, 206.

Relative properties and applicabilities of 70-30 cartridge brass, high Si bronze, 5% and 8% phosphor bronze. One of these four types is usually the answer to any application involving springs for electrically operated products.

23C-27. Dictated by Design. *Die Castings,* v. 7, Apr. 1949, p. 34-39, 46-48.

An endless-belt electronic recorder retooled for quantity production, which makes use of Al die castings to cut weight, and zinc die castings for sturdy, thin-sectioned housing with superior surface finish.

23C-28. Erfahrungen mit Bleibronze-Verbundguss im Schiffsturbinenbau. (Experiences With Lead-Bronze "Bonded" Castings in Marine Turbine Construction.) Kurt Springorum. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Feb. 1949, p. 49-51.

Experience with turbine bearings lined with lead-bronze alloy. The superiority of the latter to babbitt metal.

23C-29. Matériaux pour résistances électriques et éléments de chauffage; Elektrische Widerstandsmaterialien und Heizleiter. (Electrical Resistance Materials and Heating Elements.) Th. Zurrer and H. Bovet. *Pro-Metal,* v. 2, Feb. 1949, p. 304, 306, 311-315.

Different types of resistance metals; their production, properties, and specific uses—especially as heating elements for hot plates, ovens, and furnaces. 10 ref.

23C-30. Titanium: The New Metal. *Fortune,* v. 39, May 1949, p. 121-123.

Production methods, properties, and potentialities.

23C-31. Swinging Along. *Die Castings,* v. 7, May 1949, p. 20, 64.

Use of Zn-alloy die castings in outdoor swings, furniture, and playground equipment.

23C-32. 300 Miles to the Gallon. H. K. Barton. *Die Castings,* v. 7, May 1949, p. 23-24, 63.

French bicycle motor built almost entirely of zinc die castings.

23C-33. Worth Looking Into. *Die Castings,* v. 7, May 1949, p. 34-36, 65.

Die-cast base and frame for student microscope. Simple machining and finishing help reduce costs. Includes two Zn and two Al die castings.

23C-34. Recent Carbide Applications. *Tool & Die Journal,* v. 15, May 1949, p. 76, 78.

Use of the solid cemented-carbide boring bar, carbide milling cutters, all-purpose carbide bushings, carbide seaming rolls, and packaging wheel dressers.

23C-35. Metal Trace Elements in Agriculture: Manganese, Copper, Zinc, Boron, "Moly", Cobalt, Etc. Frank A. Gilbert. *Journal of Metals,* v. 1, sec. 1, May 1949, p. 8-11.

Twenty-five years ago, it was believed that only 10 elements were essential for plant growth and 13 for animals. At least 6 more are now known to be important. Need for the trace elements, so called because of the minute amounts needed, first became evident because growth of certain crops was practically prevented in certain areas. Certain animal diseases were also found to be caused by mineral deficiency. Incorporation of these minerals in fertilizer and livestock feed is a new outlet for the metal-producing industries of importance from a tonnage standpoint.

23C-36. Nickel Alloys in Pulp and Paper Making. R. T. Barnes, Jr., and K. H. J. Clarke. *Paper Mill News,* v. 72, May 14, 1949, p. 26, 28, 30-32, 34.

Corrosion resistance and applications of the various types.

23C-37. The Use of Silver in the Construction of Chemical Plant. J. M. Pirie. *Journal of the Imperial College Chemical Engineering Society,* v. 2, 1946, p. 27-36.

Economic aspects, chemical and physical properties, methods of use, solid-silver plant, sheet-silver linings, deposited linings and clad linings, and corrosion resistance. 12 ref.

23C-38. Rock Drilling Experience With Tungsten Carbide Bits. Blair Burwell. *Mining Congress Journal,* v. 35, May 1949, p. 24-27.

Long European experience, importance of alignment, blasting economies, bit connection problems, and service records.

23C-39. Use of Aluminum and Zinc Based Alloys for Electric Conduit Installations. *Engineer,* v. 187, May 6, 1949, p. 511.

Factors, which limited experience and known general properties of light alloys have indicated to be of particular importance.

23C-40. A Carbide Die—Its Cost and Performance. Herbert Harig. *Tool & Die Journal,* v. 15, June 1949, p. 51-52.

Use of tungsten carbide; figures as to cost, maintenance, and performance.

23C-41. Copper on Mammoth Industrial Building. *Sheet Metal Worker,* v. 40, June 1949, p. 37-38, 102.

Use of 30 tons of 16-oz. copper sheet on a large new tin-can factory.

23C-42. Tungsten Carbide Bits for Blockholing at Ajo. Alfred T. Barr. *Mining Engineering,* v. 1, sec. 1, July 1949, p. 28-29.

Tests on the above used for open pit mining.

23C-43. Where Credit Is Due. *Die Castings,* v. 7, July 1949, p. 24, 68-69.

Die-cast parts for a manually operated printing machine used in the retail credit system.

23C-44. Oil Heater Fittings. *Die Castings,* v. 7, July 1949, p. 27-28, 64.

Special fittings die cast in zinc. They are less expensive than sand cast or forged fittings, but equally serviceable.

23C-45. The Cold War. *Die Castings,* v. 7, July 1949, p. 30-32, 62.

Cams, sprockets, and other driving parts for mechanism used to kill airborne germs and viruses. Parts are die cast in Zn.

23C-46. Silber-Blei-Legierungen als Gleitlagerwerkstoffe. (Silver-Lead Alloys as Bearing Materials.) Ernst Raub. *Zeitschrift fur Metallkunde,* v. 40, May 1949, p. 167-170.

Electrodeposition of Ag-Pb alloys and their special properties; also the production of adhesive, galvanic, Ag-Pb alloy deposits on steel.

23C-47. Titanium, A New Structural Metal. *Journal of the Electrochemical Society,* v. 96, July 1949, p. 19C-21C. From address by E. A. Gee.

Production, properties, and fabrication.

23C-48. How To Keep the Bosses in Line. *Die Castings,* v. 7, Aug. 1949, p. 15, 52.

Postage-stamp vending machine with an Al die-cast frame. Zn die castings form trim and some working parts.

23C-49. Close-Fitting Parts Without Machining. *Die Castings,* v. 7, Aug. 1949, p. 16-18, 53.

Use and design of aluminum and zinc die castings for microscopes.

23C-50. Carbide Feed Rolls for Screw Machine. *Product Engineering,* v. 20. Aug. 1949, p. 103.

23C-51. California Glamorizes Copper; Application to Brick and Tile Creates Unusual Decorative Effects. *Sheet Metal Worker,* v. 40, Aug. 1949, p. 35-36.

New technique.

23C-52. The Applicability of Ceramics and Ceramals as Turbine-Blade Materials for the Newer Aircraft Power Plants. A. R. Bobrowsky. *Transactions of the American Society of Mechanical Engineers,* v. 71, Aug. 1949, p. 621-628; discussion, p. 628-629.

Tensile, flexure, thermal-shock, and oxidation data at temperatures up to 2400° F. Results of turbine-blade operation at the NACA Cleveland laboratory. 10 ref.

23C-53. What Beryllium Copper Offers the Designer. John T. Richards. *Machine Design,* v. 21, Aug. 1949, p. 117-123.

Properties, fabrication procedures, and applications.

23C-54. Les métaux précieux dans l'industrie. (Precious Metals in Industry.) E. M. Wise. *Metaux et Corrosion,* v. 24, Apr. 1949, p. 87-117.

Methods of production and chemical and mechanical properties (particularly corrosion resistance) of a series of precious metals. Main sphères of possible industrial application are indicated. 56 ref.

23C-55. Die Castings in the Automotive

Industry: The Electrical System. *Die Castings,* v. 7, Sept. 1949, p. 21-23.
Miscellaneous examples which include switch housings, connectors, and bells, horns, lamp housings, etc.

23C-56. Die Castings in the Automotive Industry: The Fuel System. *Die Castings,* v. 7, Sept. 1949, p. 24, 30.

23C-57. Die Castings in the Automotive Industry: Service Equipment. *Die Castings,* v. 7, Sept. 1949, p. 27-28.
Illustrated by description of zinc die-cast gasoline pump components.

23C-58. Die Castings in the Automotive Industry: The 1949 Oldsmobile. *Die Castings,* v. 7, Sept. 1949, p. 36-38, 66-69.
Miscellaneous die castings in this car.

23C-59. How To Select and Use Non-Ferrous Metals and Alloys. Part I. J. W. Meier. *Canadian Metals and Metallurgical Industries,* v. 12, Aug. 1949, p. 8-11, 24-25, 35-36, 38.
Properties, processing methods, and applications. (To be continued.)

23C-60. Designing With Beryllium Copper Casting Alloys. John T. Richards. *Materials & Methods,* v. 30, Sept. 1949, p. 70-73.
See abstract from *Machine Design,* item 23C-53, 1949.

23C-61. Welded Monel and Inconel Pails. *Sheet Metal Worker,* v. 40, Sept. 1949, p. 48.
Advantages and design detail.

23C-62. Die Cast Assembly With Cold Worked Fastenings. *Die Castings,* v. 7, Oct. 1949, p. 25-26, 78-79.
Zinc and aluminum die castings used in a soap dispenser.

23C-63. Handled With Care. *Die Castings,* v. 7, Oct. 1949, p. 29, 78.
Zinc die castings used for mirror handles. Other possible applications.

23C-64. A Record of Progress. D. D. Cole. *Die Castings,* v. 7, Oct. 1949, p. 37-38, 83-85.
Zinc and aluminum die castings used in the new RCA 45-r.p.m. record player and RCA Victor changer.

23C-65. Economic Factors in the Use of Copper Base Die Castings. *Die Castings,* v. 7, Oct. 1949, p. 40-43, 74-75.
Typical castings and production considerations which lead to their use.

23C-66. Tin and Its Alloys. Bruce W. Gonser. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2147-2149.
Reviews literature since 1947 on supply and application. 44 ref.

23C-67. How To Select and Use Non-Ferrous Metals and Alloys. J. W. Meier. *Canadian Metals and Metallurgical Industries,* v. 12, Sept. 1949, p. 12-15.
Main alloy groups in relation to various industrial uses. 15 ref.

23C-68. Metals in Automobiles. Kempton H. Roll. *Automotive Industries,* v. 101, Oct. 15, 1949, p. 30-31, 105.
Breakdowns showing percentages of all metals and of nonferrous metals in the average automobile. Various applications of lead, which leads the nonferrous list with 1.37% of all metals and 33.2% of the nonferrous.

23C-69. Metallic Polystyrene. *Modern Plastics,* v. 27, Nov. 1949, p. 76-78.
Plastic articles to which a metallic appearance is imparted by incorporation of metallic pigments, usually Al, Cu, or bronze alloys.

23C-70. Die Castings in the Household. Giftwares. Refrigerator Hardware. Washing Machines. Vacuum Cleaners. Power Lawn Mowers. *Die Castings,* v. 7, Nov. 1949, p. 19-26, 29-32, 36-39, 59-61, 68-71.
Varied applications of die castings.

23C-71. A Survey of Dental Alloys. Joseph R. Lane. *Journal of the American Dental Association,* v. 39, Oct. 1949, p. 414-437.
Requirements for each of the alloys, and their compositions, and behavior. The field is divided into amalgams; precious-metal alloys; cobalt and chromium alloys; stainless steels; and other metals for dentures. Table gives compositions of representative commercial amalgam alloys. Includes constitution diagrams. 65 ref.

23C-72. Cutting Costs With Beryllium Copper Molds. Richard A. Burkett and John T. Richards. *Modern Plastics,* v. 27, Dec. 1949, p. 99-101, 104, 106.
Mold-production methods from sand, pressure, or investment casting to heat treating, machining, and polishing. Welding, soldering, and plating are also sometimes used. Chromium-plated contact surfaces are necessary to prevent corrosion from phenolics or vinyls.

23C-73. Zirconium Electrodes Heart of New Arc Lamp. *Product Engineering,* v. 20, Dec. 1949, p. 148.

23C-74. Zirconium Widens Its Industrial Orbit. Warren B. Blumenthal. *Chemical Industries,* v. 65, Nov. 1949, p. 728-730.
History, production, and metallic and nonmetallic uses. 14 ref.

23C-75. Springs: the Applications of Nickel Alloy Materials. *Metal Industry,* v. 75, Nov. 25, 1949, p. 451-454.
Mechanical properties of the different commercial Ni alloys. Applications, temperature effects, and manufacturing methods.

23C-76. Small Fasteners. *Die Castings,* v. 7, Dec. 1949, p. 18-20.

Produced generally from Zn alloy. It is said that production is more economical than by screw machining, forging, cold heading, or wire-forming processes.

23C-77. Inserts and Special Fasteners for Adjustable Lamps. *Die Castings,* v. 7, Dec. 1949, p. 22-23, 25.

Production from Zn die castings.

23C-78. Dependable Driving and Braking Mechanism Built With Die Castings. *Die Castings,* v. 7, Dec. 1949, p. 28-31, 54.

Used in wire recorders. Several parts are Zn-base die castings.

23C-79. New Uses for Cobalt-Base Spring Alloy. Roger F. Waindle. *Metal Progress,* v. 56, Dec. 1949, p. 808-811.

Mechanical and corrosion-resistant properties of "Elgiloy"—developed for use in watch mainsprings. Nominal composition: 40% Co, 20% Cr, 15% Ni, 7% Mo, 2.0% Mn, 0.04% Be, 0.15% C, balance Fe. Applicability for a variety of commercial uses.

23D—Light Metals

23D-1. Magnesium Dry Cells. R. C. Kirk and A. B. Fry. *Journal of the Electrochemical Society,* v. 94, Dec. 1948, p. 277-289.

Discharge characteristics are in general similar to those of zinc cells. The best cells contain a Mg-Al-Zn alloy anode.

23D-2. Aluminum-Alloy Bascule Bridge Opened in Sunderland, England—First in World. *Engineering News-Record,* v. 141, Dec. 16, 1948, p. 10.

23D-3. Aluminum in the Electric Cable Industry. *Light Metal Age,* v. 6, Dec. 1948, p. 14-19.

Properties, various specific applications, and the present state of commercial acceptance.

23D-4. Report on Magnesium and Other Developments in Platemaking—Revived and Expanded Means for Printing by Dry Offset From Relief Plate. H. E. Swayze. *Printing Equipment Engineer,* v. 77, Dec. 1948, p. 110-112.

23D-5. Hendon Dock Aluminium Bridge. *Engineer,* v. 186, Dec. 3, 1948, p. 575-578.

First aluminum alloy bascule bridge.

23D-6. Office Buildings for a New Age. *Light Metals,* v. 11, Dec. 1948, p. 642-644.

Applications of aluminum in construction of the above in Britain.

23D-7. Realized in 1948. *Light Metals,* v. 11, Dec. 1948, p. 649-654.

A pictorial record of outstanding light-alloy applications.

23D-8. The Bridge. *Light Metals,* v. 11, Dec. 1948, p. 655-663.

Design and construction of the world's first all-aluminum bridge. It is of the twin-leaf bascule type and provides for road, rail, and pedestrian traffic.

23D-9. On the London Motor Shows. *Light Metals,* v. 11, Dec. 1948, p. 689-695.

Notable instances of the use of aluminum alloys.

23D-10. Welded Aluminum Bus in Outdoor Transformer Yard of Sewaren Generating Station. D. M. Quick. *Edison Electric Institute Bulletin,* v. 16, Dec. 1948, p. 415-418, 424.

23D-11. Aluminum Valve Construction. R. McFarland. *Corrosion,* v. 5, Jan. 1949, p. 37.

Use of aluminum for all or a portion of the parts of valves for use on certain chemical processing equipment, for distilled-water service, etc.

23D-12. The U.K. Light Alloy Industry in 1948. W. C. Devereux. *Metallurgia,* v. 39, Dec. 1948, p. 91-94.

Structural applications in Britain.

23D-13. Metallic Vinyls Make Good. *Modern Plastics,* v. 26, Feb. 1949, p. 66-67.

Metallic vinyls are compounded from vinyl resins and aluminum powder and made into flexible sheeting for production of raincoats, drapes, bedspreads. The metal powder eliminates undesired slick glossiness and makes possible attractive solid colors.

23D-14. Some Metallurgical Problems of Importance to Aircraft. H. Sutton. *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 269-284.

Some problems in relation to design tendencies, materials available, and present difficulties. The properties of modern light alloys of the Al-rich and Mg-rich types and their suitability for aircraft applications. Special characteristics of Al-Zn-Mg high-strength material, and recent advances in the use of Mg-rich alloys. Fatigue problems and fields in which further work is desirable. 22 ref.

23D-15. Yeoman Service. *Light Metals,* v. 12, Feb. 1949, p. 78-80.

Satisfactory service results with Al-alloy drag-line bucket.

23D-16. Aluminum Foil Used in Aerial Mapping. *Light Metal Age,* v. 7, Feb. 1949, p. 26.

In surveying of jungle terrain, recognition of and return to selected points during aerial mapping is facilitated by dropping 325-ft. rolls of Al foil. These unroll and are readily visible for miles around.

23D-17. The Advantages of Magnesium Extrusions in Design and Assembly. *Magazine of Magnesium,* Feb. 1949, p. 2-5.

Typical mechanical properties of three extruded forms of seven commercial Mg alloys.

23D-18. University of Minnesota Field House Reroofed With Aluminum Sheet. *Sheet Metal Worker,* v. 40, Feb. 1949, p. 33, 35.

23D-19. First Aluminum Bascule Bridge. *Modern Metals,* v. 5, Feb. 1949, p. 23-24.

Bridge was recently erected in England.

23D-20. Magnesium as a Shipboard Material; Neagtive Considerations. T. W. McConville. *Journal of the American Society of Naval Engineers,* v. 61, Feb. 1949, p. 35-44.

Experimental work indicates that use of Mg or Mg alloys, as now known, while advantageous for weight saving, would be undesirable in view of the fire hazard, for vessels likely to be subjected to gunfire.

23D-21. Aluminum Wire: The Alloys Appropriate to Wire Manufacture. D. C. G. Lees. *Wire and Wire Products,* v. 24, Mar. 1949, p. 244-247; discussion, p. 247, 282-284.

British experiences in the use of Al alloys for wire, and recommended alloys for various electrical and nonelectrical wire applications. (First of series of lectures; includes introductory remarks by Peter Smith.)

23D-22. Aluminium Alloys in Mining Equipment. J. C. Bailey. *Colliery Guardian,* v. 178, Mar. 10, 1949, p. 303-311. A condensation.

Properties, available forms, and applications.

23D-23. Light-Alloy Bearings. *Light Metals,* v. 12, Mar. 1949, p. 127-129. Based on FIAT Review: "German Science, 1939-1946. Non-Ferrous Metallurgy. Part II. Light Metals," R. Weber, E. Schmid, and H. Mann.

Summarizes data on aluminum alloy bearings. 31 ref.

23D-24. "Rolled" Sheet Aluminium Splints. A. P. Bertwistle. *Light Metals,* v. 12, Mar. 1949, p. 160-161.

Mode of preparation, advantages, patterns, and use of splints for various bone fractures.

23D-25. The Use of Aluminium Alloys in Building. E. I. Brimelow. *Metallurgia,* v. 39, Feb. 1949, p. 195-202.

Differences between the physical properties of aluminum alloys and of steel in relation to their structural and architectural use. Use of aluminum in housing and prefabricated unit construction. Factors governing selection, such as durability. Desirability of further research, especially on water pipes.

23D-26. Putting on the Pressure. *Die Castings,* v. 7, Apr. 1949, p. 32, 44-45.

The "Durol" vulcanizing press used by European garage mechanics consists of a heavy H-section frame designed for bench mounting, a lower spring-loaded anvil, and an electrically heated pressure pad assembled from four Al die castings.

23D-27. Magnesium Die Castings Offer Weight Saving and Low Cost Advantages. R. C. Cornell. *Materials & Methods,* v. 29, Apr. 1949, p. 43-46.

The case for die castings of Mg as compared to those of Al and Zn. Applications for which all three were considered.

23D-28. Light-Alloy in the Petroleum Industry. *Light Metals,* v. 12, Mar. 1949, p. 131-133.

The scope and operations of the oil industry. Use of aluminum and magnesium in the industry. (To be continued.)

23D-29. Aluminum Dredge Designed for Difficult Placer Job. John B. Juttl. *Engineering and Mining Journal,* v. 150, Apr. 1949, p. 72-75.

Use of Al alloys cuts over-all weight of dredge about 100 short tons and decreases mean draft 10 in.

23D-30. Aluminum Truck Bodies Adopted for Longer Life. *Food Industries,* v. 21, Apr. 1949, p. 108-109.

In carrying meat products, their corrosion resistance and lower repair bills more than offset higher initial cost. Construction details.

23D-31. In Three Years Magnesium Designer & Fabricator Develops Sound Enterprise. W. B. Griffin. *Modern Metals,* v. 5, Apr. 1949, p. 19-23.

Varied military applications of magnesium.

23D-32. Magnesium Alloy Castings for Reducing Product Costs. R. F. Hauser. *Modern Metals,* v. 5, Apr. 1949, p. 25-27.

Properties, applications, and advantages, as well as some limitations.

23D-33. Progress Report: Magnesium Truck Bodies. *Modern Metals,* v. 5, Apr. 1949, p. 29-32.

23D-34. Magnesium Axle Development. *Modern Metals,* v. 5, Apr. 1949, p. 35.

Shuler Axle Co., Louisville, Ky., has developed an 18,000-lb. capacity trailer axle with Mg brake assembly and Mg hub. It is lighter than a conventional steel assembly (or even aluminum).

23D-35. Magnesium Tools for Builders. *Modern Metals,* v. 5, Apr. 1949, p. 37-38.

New light-weight tools for plasterers and bricklayers and their helpers.

23D-36. Light Alloys in Aircraft Construction. H. Sutton. *Engineering,* v. 167, Apr. 15, 1949, p. 357-359. Condensed from "Some Metallurgical Problems of Importance to Aircraft," *Journal of the Institute of Metals,* v. 75, Dec. 1948, p. 269-284.

Previously abstracted from original, item 23D-14, 1949.

23D-37. Bound to Get There. *Die Castings,* v. 7, May 1949, p. 18-19, 67.

How machining time on machine for putting steel bands on boxes has been reduced from 3.97 to 0.88 hr. by changing from malleable castings to aluminum die castings. Lifting and bending stresses are distributed evenly by proper section design and reinforcement of wear points by inserts.

23D-38. A Product That Clicks. *Die Castings,* v. 7, May 1949, p. 27-30, 69-70.

Use of Al die castings in press cameras.

23D-39. Aluminum Therapy Conquers Silicosis. J. W. G. Hannon and Paul G. Bovard. *Mining Engineering,* v. 1, sec. 1, May 1949, p. 20-22.

History of Canadian medical research program which has resulted in the ability to make the statement of the title with confidence. Inhalation of Al dust at regular intervals prevents development of silicosis in a large majority of cases.

23D-40. Light-Alloy in the Petroleum Industry. *Light Metals,* v. 12, Apr. 1949, p. 196-202.

Possibilities of use in oil pipelines and accessory fittings. Comparative corrosion data for steel and Al alloys. Welding procedures. (To be continued.)

23D-41. A New Construction Material: Aluminum Siding Mill-Primed With Zinc Chromate Paint. *Paint Progress,* v. 7, No. 4, [1949], p. 2-3.

With methods of applying primer.

23D-42. Some British Achievements in Aluminium. E. G. West. *Metal Industry,* v. 74, Apr. 29, 1949, p. 323-326.

23D-43. Magnesium Alloys; British Developments and Applications. John Sully. *Metal Industry,* v. 74, Apr. 29, 1949, p. 327-329; May 6, 1949, p. 367-368.

23D-44. The Economics of Aluminium-Alloy Superstructures. W. Stanley Hinde. *Engineering,* v. 167, Apr. 29, 1949, p. 391. A condensation.

As applied to ship construction.

23D-45. The Electronics Industry Turns to Magnesium. Ralph G. Gillespie. *Magazine of Magnesium,* May 1949, p. 8-11.

Properties and various applications in electronics.

23D-46. Architect's Viewpoint. Richard Betham. *Light Metals,* v. 12, May 1949, p. 278-283.

Reviews a lecture given by W. C. Devereux on the structural use of light alloys. Choice of material and durability.

23D-47. Magnesium in the Mamba, Double Mamba and Python. *Light Metals,* v. 12, May 1949, p. 290-295.

The production and use of Mg in Armstrong Siddely gas-turbine propeller engines.

23D-48. Lagonda Printing Press. *Light Metals,* v. 12, May 1949, p. 296.

Use of Al to minimize inertia in critical moving parts.

23D-49. The Electronics Industry; Big Field for Magnesium. R. G. Gillespie. *Modern Metals,* v. 5, May 1949, p. 28-30.

Present and potential applications.

23D-50. Magnesium and Aluminum Construction Reduce Trailer Weight Over Half Ton. *Automotive Industries,* v. 100, May 15, 1949, p. 29, 86.

23D-51. The Use of Anodized Aluminum in the Construction of Calorimeter Heaters. George W. Murphy. *Review of Scientific Instruments,* v. 20, May 1949, p. 372-373.

A technique for preparing insulated heaters with very low heat lag and heat capacity and high durability.

23D-52. Engineering Applications of Oxide-Coated Aluminium. V. F. Henley. *Machinery* (London), v. 74, May 19, 1949, p. 664-667.

23D-53. Magnesium for Jets. Nathaniel F. Silsbee. *Aero Digest,* v. 58, June 1949, p. 46-47.

Applications in various jet planes.

23D-54. Aluminum: New Alcoa Administration Building at the Davenport Plant is a Gleaming Package of the Many Mature Uses of This Metal in Building. *Architectural Forum,* v. 90, June 1949, p. 76-79.

23D-55. Alcoa Builds a Rolling Mill for Aluminum of Aluminum. *Engineering*

News-Record, v. 142, June 9, 1949, p. 66-68.

Office building and rolling mill at Davenport, Iowa, having aluminum wall and roof panels.

23D-56. Aluminum Foil Fire-Fighting Suit Proves Superior in AMC Tests. *Technical Data Digest,* v. 14, June 1, 1949, p. 8-9.

Six types of suits.

23D-57. Impiego della carta di alluminio negli imballaggi. (Aluminum Foil Packaging.) A. Perrone. *Alluminio,* v. 18, Jan.-Feb. 1949, p. 21-46.

Properties of aluminum foil by itself as well as bonded to cellulose paper, plastic films, and varnishes, especially as regards permeability to moisture. Systems commonly used for packaging with these foils are considered. Tables show results obtained by tests on food and drugs, cigarettes and candy, with various wrappings.

23D-58. Light-Alloy in the Petroleum Industry. *Light Metals,* v. 12, May 1949, p. 284-289.

Use of Al-alloys in refinery equipment. Corrosion hazards. 10 ref. (To be continued.)

23D-59. Light-Alloy Pistons. *Light Metals,* v. 12, May 1949, p. 297-300. Based on FIAT Review of German Science, "Non-Ferrous Metallurgy. Part 1. Aluminum Piston Alloys", by C. Englisch, E. Schmid, and R. Weber.

Use of Al-Cu, Al-Cu-Ni, Al-Si, Al-Cu-Si, and Al-Mg alloys by the Germans during the war. Composition and mechanical properties. 17 ref. (To be concluded.)

23D-60. The Structural Uses of Aluminium in Buildings. W. C. Devereux. *Engineering,* v. 167, May 27, 1949, p. 501-504. A condensation.

Pertinent properties, including corrosion resistance and mechanical properties.

23D-61. The Brabazon Prototype: A Survey of Some of the Fabrication & Assembly Methods in Use on the World's Largest Aircraft. A. W. Morgan. *Sheet Metal Industries,* v. 26, June 1949, p. 1217-1226.

23D-62. Magnesium for Commercial Transportation. George H. Found. *Modern Metals,* v. 5, June 1949, p. 26-30.

The most important phases of transportation as they apply to current and projected uses of magnesium.

23D-63. Cast Aluminum Letters. *Modern Metals,* v. 5, June 1949, p. 32.

Use on store fronts and other sign applications.

23D-64. Magnesium Hoist of Novel Design. *Light Metals,* v. 12, June 1949, p. 304-306.

23D-65. The Century Theatre. *Light Metals,* v. 12, June 1949, p. 317-321.

Design and construction of a mobile theater unit built of aluminum alloy.

23D-66. New Pattern Treadplate. *Light Metals,* v. 12, June 1949, p. 321-322.

Al plate gives a positive grip in any direction. Pattern is deeper than on usual plating, insuring longer life.

23D-67. Light-Alloy in the Petroleum Industry. *Light Metals,* v. 12, June 1949, p. 335-344.

Continues discussion of sprayed Al coatings. Use of Al for condenser tubes and heat exchangers at refineries. (To be continued.)

23D-68. Airborne Lifeboat in Light Alloy. W. H. Dann. *Light Metals,* v. 12, June 1949, p. 345-355.

Advantages of Al as a structural material. Design, production, and operation.

23D-69. Improved Ultrasonic Delay Lines. Frank A. Metz, Jr., and Walther M. A. Andersen. *Electronics,* v. 22, July 1949, p. 96-100.

Comparative properties of various metallic and nonmetallic delay-line materials used to store intelligence for periods of several milliseconds and used in high-speed digital computers and other devices. Several forms of magnesium, 2S-O aluminum, molybdenum, tungsten, fused quartz, pyrex, and plate glass were studied. Forged Mg-alloy lines proved superior.

23D-70. Aluminium Alloys for Shipbuilding. J. Lenaghan. *Engineering,* v. 167, June 17, 1949, p. 571-572.

23D-71. Magnesium Used as Structural Material. J. P. Donald Garges. *Aviation Week,* v. 51, July 4, 1949, p. 26-27, 29-30.

Redesigned magnesium F-80 wing reduces number of pieces to 31% and number of fasteners to 38% of those required by an Al alloy wing.

23D-72. Le pont du Hendon Dock a Sunderland. (Hendon Dock Junction Bridge.) Jean Romeyer. *Revue de l'Aluminium,* v. 26, May 1949, p. 158-162.

Construction of aluminum double-leaf trunnion bascule-type bridge at Hendon Dock, Sunderland.

23D-73. Magnesium Castings for Cost Reduction. *Electrical Manufacturing,* v. 44, July 1949, p. 98-101, 178, 180.

As applied to electrical equipment, appliances, and business machines.

23D-74. Applications of Light Metals.

Light Metals, v. 12, July 1949, p. 388-392.

A bibliography of articles on applications of Al and Mg and their alloys which have appeared in *Light Metals,* June 1946 to May 1949.

23D-75. Great Strength Claimed for Aluminum Roof. *Petroleum Refiner,* v. 28, July 1949, p. 149.

New patented, "self-supporting" Al roof now being manufactured by a British firm and claimed to have the same strength as a similar steel structure. It is intended primarily as a roof for oil or chemical storage tanks.

23D-76. Aluminum Foil Finds New Uses as a Packaging and Insulating Material. Kenneth Rose. *Materials & Methods,* v. 30, July 1949, p. 63-65.

Properties and applications.

23D-77. Magnesium Uses Grow In Textile Equipment Field. H. Nuernberger. *Modern Metals,* v. 5, July 1949, p. 14-16.

Some of the more important magnesium applications in the above field.

23D-78. Two-Cycle Aluminum Diesels. *Modern Metals,* v. 5, July 1949, p. 18.

Al castings are used almost throughout.

23D-79. Orthopedic Braces Now Mass-Produced. *Modern Metals,* v. 5, July 1949, p. 20.

New lightweight orthopedic braces made of Al forgings, tubing, and screw-machine parts.

23D-80. Alcoa's Davenport Office Building. *Modern Metals,* v. 5, July 1949, p. 22.

Building utilizes aluminum wall panels, window frames, wiring, hardware, partition facings, ducts, doors, flashing, fixtures, paint, and acoustical ceiling panels—an estimated million pounds in all. These products are made from extrusions, castings, sheet, tubing, and foil.

23D-81. Ultra-Light Gasoline Engines. *Modern Metals,* v. 5, July 1949, p. 24.

2-hp., twin-cylinder engine consisting largely of Al, and weighs only 23 lbs.

23D-82. An Aluminum House Promotion. *Modern Metals,* v. 5, July 1949, p. 30. Based on article in *Canadian Homes & Gardens,* Apr. 1949.

House consisting largely of aluminum being sold by a Toronto, Canada, department store.

23D-83. Die-Forged Aluminum Wheels for Trailers. *Automotive Industries,* v. 101, Aug. 1, 1949, p. 45, 60.

The A51S-T6 alloy is used for freight trailers. A 50-lb. weight reduction per wheel is achieved.

23D-84. Sull'uso clinico dell'alluminio metallico. (Clinical Uses of Metallic Aluminum). A. Cavallazzi. *Alluminio,* v. 18, Mar.-Apr. 1949, p. 158-160.

Results of experiments on the therapeutic value of Al foil and powder for healing different types of wounds.

23D-85. Pressure-Tight Die Castings. *Die Castings,* v. 7, Aug. 1949, p. 19-20, 61-63.

Production of Al die castings for hydraulic-circuit components by boosting die-casting-machine pressures and by adequate overflow vents and careful gating. These castings are made to withstand 1800 psi.

23D-86. Aluminum School Furniture. *Modern Metals,* v. 5, Aug. 1949, p. 18-19.

23D-87. Something New in Buildings. *Modern Metals,* v. 5, Aug. 1949, p. 20.

Unique feature of office building is vertical aluminum fins for shading the south and west windows.

23D-88. Gas Engine Powers Portable Unit. John L. Ryde. *Machine Design,* v. 21, Aug. 1949, p. 106-108.

Use of magnesium die castings in portable chain saw.

23D-89. Light Alloys in the Petroleum Industry. (Continued.) *Light Metals,* v. 12, July 1949, p. 372-381.

Aluminum paint; use of Al foil for storage tanks; importance of Al in storage-tank construction. 23 ref. (To be continued.)

23D-90. Light Alloys in Mail and Phone Services. *Light Metals,* v. 12, Aug. 1949, p. 450-451.

Telegraph and telephone-pole cross-arms and private post-office boxes.

23D-91. Emploi des alliages d'aluminium sur les wagons pour transport de charbon. (Use of Aluminum Alloys in Railway Coal Cars.) Jean Hérenguel. *Revue de l'Aluminium,* v. 26, June 1949, p. 195-201.

Results of experimental tests in which side panels were replaced by "Durcilium" and "Alumag 50" panels. Examination after 21 months' service revealed that the panels had not suffered from corrosion. Mechanical resistance to shocks was good.

23D-92. Aluminum Moves Ahead in Building. *Light Metal Age,* v. 7, Aug. 1949, p. 14-15, 20.

New structural applications—office buildings and tanks.

23D-93. Aluminum Die Cast Door Frame Cuts Costs for Kaiser-Frazer Corp. *Light Metal Age,* v. 7, Aug. 1949, p. 16-17.

23D-94. Some Aluminum Uses at the Paris Automotive Exhibition. Maurice

Victor. *Modern Metals,* v. 5, Aug. 1949, p. 22-25. Translated from *Revue de l'Aluminium.*

23D-95. Die Castings in the Automotive Industry. Structural Members. *Die Castings,* v. 7, Sept. 1949, p. 31-33.
Die-cast Kaiser-Frazer door frame in aluminum. Other possibilities.

23D-96. Metal Type Reflective Insulations Prove Themselves. James G. Macormack. *Refrigerating Engineering,* v. 57, Sept. 1949, p. 885-889, 922.
Installation of Alumiseal for various refrigerating applications. Advantages of this method of insulation.

23D-97. Ship-Building and Light Alloys. *Light Metals,* **v. 12, July 1949, p. 404-409.**
Summarizes and comments on papers presented at a recent symposium of the British Aluminium Development Assn. (To be concluded.)

23D-98. Woodworking Hobby Machine Tool Utilizes Aluminum. *Modern Metals,* v. 5, Sept. 1949, p. 22-23.
A combination lathe, circular saw, sabre saw, and a buffer-polisher-sander is fabricated from aluminum castings.

23D-99. Diesel Locomotives Gradually Switching to Aluminum. *Modern Metals,* v. 5, Sept. 1949, p. 28.
Horsepower ratings are kept high by supercharged or high speed diesel engines, and weight is reduced by use of aluminum.

23D-100. Engineering and Marine and Welding Exhibitions. *Light Metals,* v. 12, Sept. 1949, p. 475-503.
Applications of aluminum in varied industries.

23D-101. Welding, Shipbuilding, Mining. *Light Metals,* v. 12, Sept. 1949, p. 504-507.
An appraisal by the Aluminium Development Association of the present situation in the light of practice demonstrated at the Engineering and Marine and Welding Exhibitions and Scottish Industries Exhibitions.

23D-102. The Gresford Gages. R. M. Hay. *Light Metals,* v. 12, Sept. 1949, p. 517-521.
Use of aluminum in mine-shaft equipment. Design and construction of the first all-aluminum-alloy mine cages to be used in British mines, recently installed at Gresford Colliery.

23D-103. Scottish Industries. *Light Metals,* v. 12, Sept. 1949, p. 522-530.
Applications of aluminum demonstrated at the exhibition. Includes list of companies.

23D-104. Aluminium in Shipbuilding. E. C. Goldsworthy. *Engineers' Digest.* v. 10, Aug. 1949, p. 274-278.

23D-105. Aluminum Welded Crane. W. F. Walker. *Canadian Mining Journal,* v. 70, Sept. 1949, p. 83-84.
Welded overhead electric traveling crane, 15-ton capacity, 55-foot span, believed to be the first of its type, designed and fabricated from aluminum.

23D-106. Aluminum Age Opens New Era in Farm Irrigation. Roscoe Fleming. *What's New in Crops & Soils,* v. 2, Oct. 1949, p. 10-13, 23.
Expanding use of aluminum pipe sprinkling systems for irrigation.

23D-107. Cast Aluminum Panels Comprise Building's Exterior. *Foundry,* v. 77, Oct. 1949, p. 134.
Office building for Aluminum Co., Davenport, Iowa, makes use of sectional, cast aluminum panels for the exterior sheathing.

23D-108. Dial System Die Castings. F. K. Van Almelo and P. Rodney Sultzbach. *Die Castings,* v. 7, Oct. 1949, p. 21, 81-83.
Two aluminum die castings used by the Stromberg-Carlson Co. in automatic dial telephone equipment.

23D-109. Light Alloy Building. *Metal Industry,* v. 75, Sept. 23, 1949, p. 254.
Standardized interchangeable components and boltless construction in which connections are made by special sockets.

23D-110. Aluminum Alloys. E. D. Verink, Jr., and R. H. Brown. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2095-2097.
Developments in uses. 38 ref.

23D-111. Aluminum and Magnesium Castings. Walter Bonsack. *Canadian Metals and Metallurgical Industries,* v. 12, Sept. 1949, p. 20-23, 33, 35.
Choice of alloy, casting method, and heat treatment for desired properties.

23D-112. Use of Aluminum in the Petroleum Industry. Fred L. Plummer. *Petroleum Refiner,* v. 28, Oct. 1949, p. 97-106.
Use of aluminum in attacking high costs resulting from corrosion as well as its other advantages. 13 ref.

23D-113. New Uses for Aluminum. B. J. Fletcher. *Petroleum Processing,* v. 4, Oct. 1949, p. 1105-1108.
Miscellaneous applications of Al and Al alloys in the petroleum industry.

23D-114. New Machine Designed To Slash Printing Costs. *Modern Metals,* v. 5, Oct. 1949, p. 18-19.
Machine called "Printasign", made largely of aluminum, designed for printing signs and cards in six type sizes. Use of aluminum type box and

carriage reduces weight, hence operator fatigue; and superior machinability reduces production costs.

23D-115. Aluminum Frame Development. *Modern Metals,* v. 5, Oct. 1949, p. 26-27.

Aluminum picture frames which can be taken apart and re-assembled. Extruded 63S-T5 is used for the frame proper and stamped 24S-T4 plate for the corner fasteners.

23D-116. Aluminum Box Car Carries Record Load. *Modern Metals,* v. 5, Oct. 1949, p. 28.

Weight savings and other advantages.

23D-117. Builders Concrete Forms Made of Magnesium. *Modern Metals,* v. 5, Oct. 1949, p. 31.

23D-118. How Permanente Finds New Uses for Aluminum. *Western Metals,* v. 7, Oct. 1949, p. 30-31.

Organization of the Permanente Metals Corp. research laboratory. Products and techniques introduced by the laboratory.

23D-119. Silo Roofs of Aluminum. *Sheet Metal Worker,* v. 41, Oct. 1949, p. 47-48.

23D-120. In the Nursery. *Light Metals,* v. 12, Oct. 1949, p. 543-547.

Various light-alloy applications.

23D-121. The Michelin Rubber-Tyred Train. *Light Metals,* v. 12, Oct. 1949, p. 551-559. Based on article in *Revue de l'Aluminium,* July-Aug. 1949, p. 239+.

Constructional details, showing extensive use of Al and its alloys.

23D-122. The Aluminium Roof in Tropical Service. *Light Metals,* v. 12, Oct. 1949, p. 583-585.

Results of the examination of Al-alloy roofing sheet in use under various unfavorable conditions in a tropical environment. Confirms suitability of the material for the purpose and its superiority over galvanized sheet and asbestos-cement board.

23D-123. Dachkonstruktionen für Industriehallen aus Leichtmetall. (Light-Metal Roof Construction for Industrial Buildings.) K. Renner. *Metall,* v. 3, Aug. 1949, p. 252-254.

Large-scale experiments have shown that light metals can be used for the construction of strong and corrosion resistant buildings. Methods of preventing corrosion (especially of contact corrosion). Details of design.

23D-124. Aluminum Crane Requires Less Hp. *Product Engineering,* v. 20, Nov. 1949, p. 105.

Overhead travelling crane of welded Al construction.

23D-125. Our Use of Magnesium Alloy Printing Plates. Paul E. Gallagher. *Photoengravers' Bulletin,* v. 39, Oct. 1949, p. 68-75.

Experiences and advantages.

23D-126. Magnesium, Speed, and Progress. F. Richard Lilly. *Photoengravers' Bulletin,* v. 39, Oct. 1949, p. 76-79.

Experiences with use of magnesium printing plates. Recommended procedures.

23D-127. Magnesium and Its Commercial Aspects. Charles Wilhelm. *Photoengravers' Bulletin,* v. 39, Oct. 1949, p. 79, 82-85.

Use of Mg in printing plates from the standpoint of a commercial printer.

23D-128. Aluminium Busbars; Wider Use of Light Metal Conductors in the Electrical Industry. John Boyne. *Engineering & Chemical Digest,* v. 1, Sept. 1949, p. 97-99.

Condensed from *British Engineer,* v. 8, no. 3.

23D-129. Drawn and Extruded Aluminum Products in Relation to the Electrical Industry. H. V. Menking. *Electrical Engineering,* v. 68, Dec. 1949, p. 1094. A condensation.

Properties and applications.

23D-130. Aluminum Panels for Modern Ceiling Design. *Modern Metals,* v. 5, Nov. 1949, p. 15.

All-metal acoustical ceiling.

23D-131. Army Buys Air-Borne Aluminum Boats. *Modern Metals,* v. 5, Nov. 1949, p. 20.

23D-132. Aluminum Door Frames Added to Pittco Store Front Products. *Modern Metals,* v. 5, Nov. 1949, p. 22-23.

23D-133. Light Alloy in the Petroleum Industry. (Concluded.) *Light Metals,* v. 12, Oct. 1949, p. 548-550; Nov. 1949, p. 633-640.

Oct. installment: Al paint and use of Al foil for storage tanks. Importance of Al in storage-tank construction. Final installment: Mg tank trucks, Al railway tank cars, Al hoses, Mg alloy pipes, Al gasoline cans, and uses of Mg in the oil field and for cathodic protection. 62 ref.

23D-134. New Roof for Old. *Light Metals,* v. 12, Nov. 1949, p. 597-599.

Installation of new aluminum alloy roof.

23D-135. Duralumin in Structural Work. *Light Metals,* v. 12, Nov. 1949, p. 610-612.

23D-136. Aluminium for Electrical Conductors. András Domony. *Light Metals,* v. 12, Nov. 1949, p. 614-626.

Translated from *Aluminium* (Hungary), no. 1, 1949, p. 159.

Relationship between the metallurgical and electrical properties of Al and certain Al alloys. Production procedure for metal at the smelter and for conductor wire; current lines of research toward improving materials at present available for such wire.

23D-137. Conception et construction de la Dyna-Panhard. (Design and Construction of the Dyna-Panhard.) Maurice Victor and Jean Blanchot. *Revue de l'Aluminium,* v. 26, Sept. 1949, p. 287-296.

The Dyna-Panhard is said to be the first automobile to be built on a mass-production basis with body and numerous other parts of light metals.

23D-138. La rame en alliages légers de la C.I.M.T. (Light-Alloy Rolling Stock of the C.I.M.T.) Maurice Victor. *Revue de l'Aluminium,* v. 26, July-Aug. 1949, p. 239-255.

Design and construction of French railway passenger cars which use a high proportion of light alloys and special pneumatic tires which ride on the rails. Numerous diagrams and illustrations.

23D-139. Electric Fuses in Aluminium Wire. *Wire Industry,* v. 16, Nov. 1949, p. 906.

Superior results obtained.

23D-140. Conception et construction de la Dyna-Panhard. II. La carrosserie. (Design and Construction of the Dyna-Panhard. II. The Body.) Maurice Victor. *Revue de l'Aluminium,* v. 26, Oct. 1949, p. 320-331.

Body of French automobile is entirely of light metal. Details of construction and over-all appearance. Performance data.

23D-141. Les piles électriques au Magnésium. (Use of Magnesium in Batteries.) Bernard Raclot. *Revue de l'Aluminium,* v. 26, Oct. 1949, p. 343-345.

Characteristics of batteries having Mg cathodes. Such batteries produce triple the current and 2½ times the voltage of those using Zn cathodes. Three types are the Gordon or "water" battery; the Burgess and Dow, which uses an acid solution; and a type using a saline electrolyte.

23D-142. Design of a Portable Saw. *Die Castings,* v. 7, Dec. 1949, p. 32-34, 55-56.

Utilizes Al-alloy die castings for many parts.

23D-143. Aluminum Used Successfully in Precision Instruments. *Materials & Methods,* v. 30, Dec. 1949, p. 50-52.

Varied uses and miscellaneous fabrication operations.

SECTION XXIV

DESIGN

A—General

24A-1. Floating Bearings Minimize Vibration. *Iron Age,* v. 162, Dec. 23, 1948, p. 51. Based on article by Paul Gerard in *Comptes Rendus* (France).

New type of bearing designed to eliminate vibration by allowing the shaft to rotate about its axis of inertia. The shaft makes no contact with the bearing, being supported entirely by fluid pressure. This condition can be maintained, even when the shaft is stationary, if the fluid is pressurized by an independent pump.

24A-2. A Theoretical Discussion of Pitting Failures in Gears. R. Beeching and W. Nicholls. *Institution of Mechanical Engineers, Proceedings,* v. 158, Dec. 1948, p. 317-323; discussion, p. 323-326.

Theoretical consideration of the stresses that cause surface failure of gear teeth. Methods of calculating permissible line load between contacting cylindrical surfaces for static or cyclic conditions, and probable effects of friction. Maximum case thicknesses for steel components of varying core strength when subjected to contact stresses.

24A-3. On the Plastic Bending of Circular Plates Under Uniform Transverse Loads. D. Trifan. *Quarterly of Applied Mathematics,* v. 6, Jan. 1949, p. 417-427.

A mathematical analysis applied to the specific problem of a 24S-T, aluminum alloy in a thin, circular plate built in along its entire boundary, and with uniformly distributed lateral load. Although the theories of plastic flow and plastic deformation are founded on different hypotheses, their predictions for circular plates under uniform loads and for the specific material considered are identical for all practical purposes. 13 ref.

24A-4 (Book). Mathematics at Work. Holbrook L. Horton. 728 pages. Industrial Press, 148 Lafayette St., New York 13, N. Y. $6.00.

A working manual intended for machine designers, tool engineers, gage designers, mechanical draftsmen, technical or trade school students, and teachers. Practical applications of arithmetic, algebra, geometry, trigonometry, and logarithms are illustrated.

24A-5. (Book). Mechanics of Materials. Glen Murphy. 304 pages. Irwin-Farnham Publishing Co., 332 South Michigan Ave., Chicago 4, Ill. $4.50.

Textbook was written to assist in developing an understanding of the behavior of loaded structural members and machine parts. Principles of statics, geometrical characteristics of the loaded member, and effects of the material's properties are emphasized in considering each type of stress situation. A minimum of emphasis is placed on formulas as such. Some elementary aspects of design application are included, as well as sample problems following each chapter. (From review in *Machine Design.*)

24A-6. Design Charts for Longitudinally Stiffened Wing Compression Panels. Norris F. Dow. *SAE Quarterly Transactions,* v. 3, Jan. 1949, p. 122-142; discussion, p. 143-44.

Problems encountered in design of the above; results of extensive experimental investigations on the strength of such panels; development of design charts.

24A-7. Is it Cheaper to Buy or Make Parts? Alvah I. Root. *Materials & Methods,* v. 29, Jan. 1949, p. 54-55.

Example of the thumb piece for kitchen-cabinet handles. Cost analysis of production of this piece by metal stamping, by die casting, or from plastic.

24A-8. Needed—More Coordination Between Materials, Design and Processing. H. R. Clauser. *Materials & Methods,* v. 29, Jan. 1949, p. 70-73.

Illustrates the above by a number of specific cases.

24A-9. Designing Bolts to Resist Shock Loading. Charles Lipson. *Fasteners,* v. 5, No. 3, [1948], p. 4-6.

Application of well-known principles can increase bolt life appreciably.

24A-10. Locking Cap Screws in Tapped Holes. William G. Waltermire. *Fasteners,* v. 5, No. 3, [1948], p. 14-19.

Various methods for the above. The different devices used include lockwashers, wire locking, and use of special threads and head designs.

24A-11. The Development of Complex Patterns. (Continued.) A. Dickason. *Sheet Metal Industries,* v. 25, July 1948, p. 1395-1398; Oct. 1948, p. 2013-2017.

Sheet-metal layout principles. July: delivery and feed chutes; Oct.: the branch piece, the right conical cover, and the transformer connection. (To be continued.)

24A-12. The Commercial Weldery; A New Service and Tool for Industry. Kenneth F. Ode. *Mechanical Engineering,* v. 71, Feb. 1949, p. 139-142.

Welded design, economics, and factors to be considered in deciding between welding and some other means of fabrication.

24A-13. Some Speculations on the Future of Structural Engineering. I. Levin. *Engineer,* v. 187, Jan. 21, 1949, p. 76-77.

Design developments and the use of reinforced concrete structures, welding, high-tensile steel, and aluminum.

24A-14. The Theory of Stresses in Two-Component Glass to Metal Tube Seals. H. Rawson. *Journal of Scientific Instruments and of Physics in Industry,* v. 26, Jan. 1949, p. 25-27.

A theory, based on the Lamé theory for stresses in thick cylinders, gives the relationship between the tangential, radial, and axial stresses, at a point in a two-component tube seal and the distance of that point from the central axis of the seal. Curves show relationships between values of principal stresses at the seal interface and dimensions of the seal.

24A-15. A Reconsideration of Deformation Theories of Plasticity. D. C. Drucker. *American Society of Mechanical Engineers,* Paper No. 48-A-81, 1948, 10 pages.

Calculations and formulas. Illustrates mathematically the conclusion that large changes in the components of permanent strain may accompany very small increases in loading despite strain hardening.

24A-16. Designing for Welding. Part II. Wallace A. Stanley. *Welding Journal,* v. 28, Feb. 1949, p. 162.

Designing for roll spot welding, flash butt welding, and upset butt welding. (To be continued.)

24A-17. Design of Precision Cast Parts. J. G. Henderson. *Product Engineering,* v. 20, Feb. 1949, p. 100-102.

Design rules for reducing die cost and casting difficulties.

24A-18. Progressive Die Design. Part XII. C. W. Hinman. *Modern Machine Shop,* v. 21, Feb. 1949, p. 166-168, 170.

Describes two types of transfer feeds and a progressive die equipped with a transfer dial.

24A-19. Mechanical Investigations of Gas Turbine Components. Carl Schabtach, *American Society of Mechanical Engineers,* Paper No. 48-A-47, 1948, 13 pages.

Bursting strength of turbine and compressor wheels, fatigue strength of compressor blades, deflection and stress in nozzle diaphragms, resistance to fluctuating thermal stresses, tensile strength of dovetail attachments, rotor critical speeds, and other design criteria.

24A-20. (Book). **Design for Welding in Mechanical Engineering.** F. Koenigsberger. 210 pages. Longmans, Green & Co., 55 Fifth Ave., New York 3, N. Y.

Economic, technical and practical reasons for or against welded construction for particular cases, in comparison with other processes. Mechanical properties, weldability of steels, and shapes and sections suitable for use. Influence of properties of material upon the shape of a structure for which strength and stiffness are required to a high degree.

24A-21. (Book). **The Failure of Metals by Fatigue.** 505 pages. 1947. Melbourne University Press, Melbourne, Australia. £2.2.0.

Design, development, maintenance of machine structures, and components subjected to cyclic stresses. Proceedings of a symposium held in the University of Melbourne. (Individual papers have been previously abstracted.)

24A-22. Design in Logic: The Planet Satellite. *Magazine of Magnesium,* Feb. 1949, p. 8-11. Reprinted from *Flight,* July 15, 1948.

Details of the design of unorthodox British four-seater personal aircraft made by Planet Aircraft, Ltd., and named the "Satellite". Magnesium is used extensively.

24A-23. Physical Aspects of Insect Wire Screening. Ralph W. Bacon. *Wire and Wire Products,* v. 24, Feb. 1949, p. 142-146.

Physical characteristics of various types and mesh sizes of insect wire screening: relative strength, resistance to bending and abrasion, expansion and contraction, and obstruction to the free passage of light and air. Both ferrous and nonferrous screening were tested.

24A-24. Why Can't Closer Tolerances Be Held for Coiled Springs Commercially? Part II. (Concluded.) *Mainspring,* v. 12, Feb. 1949, p. 3, 6-7.

Variation in free length is the 5th variable now discussed.

24A-25. Blank Diameters for Deep-Drawn Cones. B. Spector. *American Machinist,* v. 93, Feb. 24, 1949, p. 84-86.

Diagrams and mathematics which eliminate guesswork in determining blank size of dies for deep drawing cones.

24A-26. Effects of Impact on Simple Elastic Structures. J. M. Frankland. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 7-25; discussion, p. 25-27.

Elementary terms and factors concerned in the problem of impact loading. Representative cases of impact loading and their effects upon a simple undamped system with one degree of freedom. Means of judging to what degree the behavior of the idealized system is realized among actual ship and other structures. Applications to the strength of structures under impact. Design of instruments for making observations during impact tests and interpretation of their records. Formal mathematical treatment is given in the appendixes.

24A-27. A Method of Estimating Equivalent Static Loads in Simple Elastic Structures. G. E. Hudson. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 28-40.

A graphical method of estimating the static load which will produce a deflection of a simple structure equal to its peak deflection under a dynamic load. The method also permits estimation of peak deflection and time to reach this peak. A general means of finding graphically the motion of such a linear elastic system under dynamic loading.

24A-28. Studies of Continuous Bridge Trusses With Models. W. J. Eney. *Proceedings of the Society for Experimental Stress Analysis,* v. 6, no. 2, 1948, p. 94-105.

Development and use of bolted brass-spring models. Design of the model and its use to determine influence lines for pier reactions, truss deflections, and jacking forces.

24A-29. Designed With Textured Metals. Howard Ketcham. *Product Engineering,* v. 20, Mar. 1949, p. 102-106.

Various applications of the 18 standard patterns made by Rigidized Metal Corp.

24A-30. Determining and Scribing Radii "Off the Board." *Tool & Die Journal,* v. 14, Mar. 1949, p. 56, 58, 82.

Calculations and diagrams for use in layout of plate-blanking dies.

24A-31. Punch and Die Construction Practices. Movable Stock-Guides for Blanking Dies. Federico Strasser. *Tool & Die Journal,* v. 14, Mar. 1949, p. 60-61.

24A-32. A Combination Piercing, Cut-Off and Bend Die. *Tool & Die Journal,* v. 14, Mar. 1949, p. 61-62.

24A-33. Stresses in Turbine Rotors of Disc Construction. G. F. C. Rogers. *Engineering,* v. 167, Feb. 11, 1949, p. 121-122.

Welded rotors with solid discs result in lighter-weight construction, for the same allowable stresses, than discs mounted on a shaft. Method for calculating stresses in rotors of the welded-disc type. Results of dimensionless plotting.

24A-34. A Designer Looks at Electroplating. J. S. McDaniel. *Plating,* v. 36, Mar. 1949, p. 234, 277.

A general discussion.

24A-35. Temperature Stresses in Gas Turbine Rotors at Starting. A. Meldahl. *Brown Boveri Review,* v. 35, Sept.-Oct. 1948, p. 247-252.

A mathematical analysis. Internal stresses arising from temperature differences are calculated and results plotted.

24A-36. Chance Laws Aid Designer in Assigning Tolerances. *SAE Journal,* v. 57, Mar. 1949, p. 24-26. Based on "Cost-Cutting Chance Laws Can Control Design Tolerances," by Dorian Shainin.

Use of statistical methods to assign tolerances to the dimensions of a product while it is still in the design stage. Includes nomogram and chart for combining tolerances statistically.

24A-37. Elastic and Plastic Buckling of Simply Supported Metalite Type

Sandwich Plates in Compression. Paul Seide and Elbridge Z. Stowell. *National Advisory Committee for Aeronautics,* Technical Note no. 1822, Feb. 1949, 24 pages.

Solution of the problem of the compressive buckling of simply supported, flat, rectangular, Metalite-type sandwich plates stressed either in the elastic range or in the plastic range. Charts for the analysis of long sandwich plates having face materials of 24S-T3 Al alloy, 75S-T6 Alclad Al alloy, and stainless steel.

24A-38. The Buckling of Parallel Simply Supported Tension and Compression Members Connected by Elastic Deflectional Springs. Paul Seide and John F. Eppler. *National Advisory Committee for Aeronautics,* Technical Note no. 1823, Feb. 1949, 18 pages.

Mathematical investigation as an approximation to the problem of the effect of finite stiffness of ribs and tension surface on the buckling load of the compression surface of a wing.

24A-39. Some New Problems on Shells and Thin Structures. V. S. Vlasov. *National Advisory Committee for Aeronautics,* Technical Memorandum no. 1204, Mar. 1949, 46 pages. Translated from *Izvestia Akademii Nauk SSSR* (Bulletin of the Academy of Sciences of the USSR), No. 1, 1947.

A theory of cylindrical shells is developed. Application to stress analysis, vibration analysis, and buckling analysis of shells.

24A-40. The Design of Surface Broaches. Artur Schatz. *Machinery* (American), v. 55, Mar. 1949, p. 143-148.

Surface-broach design cannot be accomplished by mathematical means alone. Factors influencing the design of the broach that originate in the work, the machining operation, the broaching machine, and the method of tool manufacture and their relationships.

24A-41. Figuring Weights or Dimensions of Similar Shapes. Fred B. Money. *Machinery* (American), v. 55, Mar. 1949, p. 149.

Mathematical shortcuts, frequently useful in the metal trades, particularly in forging and casting.

24A-42. Three-Dimensional Solution for the Stress Concentration Around a Circular Hole in a Plate of Arbitrary Thickness. E. Sternberg and M. A. Sadowsky. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 27-38.

24A-43. The Basic Elastic Theory of Vessel Heads Under Internal Pressure. G. W. Watts and W. R. Burrows. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 55-73.

Means for calculating internal-pressure stresses and deformations at or near the junctures of semi-infinite cylindrical vessel shells with several standard head shapes. A system of dimensionless variables is proposed for each head shape. Methods of showing critical head stresses in terms of these dimensionless variables either by graphs or by tabulations. 47 ref.

24A-44. On the Stability of Plates Reinforced by Ribs. J. M. Klitchieff. *Journal of Applied Mechanics,* v. 16. *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 74-76.

An expression is developed which gives directly the required rigidity of the ribs by transformation of the expression for critical compressive forces developed by Timoshenko. Use of trigonometric series is made to calculate effective width of plate. A numerical example compares results with those obtained by use of Lloyd's Rules (1931-1932) for cargo ship design.

24A-45. Theory of the Damped Dynamic Vibration Absorber for Inertial Disturbances. J. E. Brock. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), Mar. 1949, p. 86-92.

Theory is developed mathematically for the case in which the amplitude of the disturbing force varies as the square of its frequency. Such cases are of practical importance; for example, disturbances due to unbalance in rotating machinery are of this type.

24A-46. Thick Cylinders and Interference Fits. N. P. Skinner. *Machinery* (London), v. 74, Feb. 24, 1949, p. 234-237.

Graphical methods which lead to considerable simplification in determining the wall thickness of thick cylinders and the amount of interference required for shrinkage fits. Examples.

24A-47. Corrosion Prevention; Influence of Correct Design of Metal Structures. G. T. Colegate. *Meal Industry,* v. 74, Feb. 18, 1949, p. 123-125; Feb. 25, 1949, p. 151-153; Mar. 4, 1949, p. 167-168.

Minimization of corrosion is to some extent dependent on design. The types of corrosion that can be avoided in this way and the methods adopted.

24A-48. Principles of Structural Design for Minimum Weight. F. R. Shanley. *Journal of the Aeronautical Sciences,* v. 16, Mar. 1949, p. 133-149, 188.

How determination of the lightest practical arrangement of material which will transmit the required loads through the specified distances may be accomplished by use of a structural index. Examples include the tubular column, stiffened flat plate under axial load, the unstiffened plate with edge support, shear-carrying members, and cylindrical shells in bending. Methods of comparing various materials on a weight basis are applied to several aluminum alloys, magnesium alloy, and stainless steel.

24A-49. Sur la détermination des tensions dans une membrane dépourvue de raideur. (Concerning the Determination of Stresses in Nonrigid Membranes.) Henri Pailloux. *Comptes Rendus* (France), v. 228, Jan. 3, 1949, p. 54-56.

Equations are proposed for the relationship between stresses and deformations. These equations are interpreted for different variables and a method for determination of the above is indicated.

24A-50. Oscillatory Sliding Friction (The Frictionless Bearing). Stephan Thyssen-Bornemisza. *Microtecnic* (English Edition), v. 11, Dec. 1948, p. 254-262. Translated from the German.

New type of bearing in which friction is reduced to 0.1-0.01 of normal sliding friction. Experimental setup developed to make comparative analyses of friction in the two types. Use for steel-steel combinations in which surface conditions, angles of oscillation, etc., were varied. (To be continued.)

24A-51. Estimating Upset Forgings. Albert P. Berberich. *American Machinist,* v. 93, Mar. 24, 1949, p. 141, 143.

Table and diagrams to aid in estimating material required in upset forgings and for calculating cavities of upsetting dies for stock diameters from ⅛ to 4 in.

24A-52. Bending of Beams With Creep. E. P. Popov. *Journal of Applied Physics,* v. 20, Mar. 1949, p. 251-256.

A method of calculating stresses and deflections. Complete tension-creep data at constant temperature are used to define creep characteristics of the material. Stresses and deflections may be calculated for any desired time interval including time prior to the occurrence of steady-state creep. 12 ref.

24A-53. Designing for Gas Turbine Materials. M. H. Young. *Aviation Week,* v. 50, Mar. 21, 1949, p. 20-22, 24-25.

The various factors involved; comparative mechanical properties of different high-temperature materials; effects of design changes on performance.

24A-54. Lubrication. E. Crankshaw and J. Menrath. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 165-173; discussion, p. 205-207.

Formulas for calculating amount of lubrication required and effects of design on amount of oil which will flow under given pressures.

24A-55. Neue Wege der Festigkeitsrechnung. (New Methods of Calculating Strength Properties.) E. Siebel. *Zeitschrift des Vereines Deutscher Ingenieure,* new ser., v. 90, May 1948, p. 135-139.

Proposes that the calculation of strength values be based on the theoretical maximum elasticity of nonuniformly stressed structural parts, regardless of whether they are subjected to static or fatigue stresses. Compares strength behaviors of materials under uniform and nonuniform stresses. Calculation of different types of stress. 10 ref.

24A-56. Die-Casting Practice and Technique. VIII. Associated Design Problems. W. M. Halliday. *Metal Industry,* v. 74, Mar. 11, 1949, p. 189-192; Mar. 18, 1949, p. 211-213; Mar. 25, 1949, p. 223-225.

Need for accuracy; gravity dies, manner of ejection of products, gravity-die design, and gravity-die construction.

24A-57. The Plastic Yielding of Notched Bars Under Tension. R. Hill. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 2, Mar. 1949, p. 40-52.

The state of stress in the core of a notched bar is analyzed at the moment when pronounced plastic yielding begins. The theory is two-dimensional and an ideal plastic-rigid material is assumed. Following a general analysis of the problem, the magnitude of the strain factor is calculated for a deep notch with a semi-circular root. The correct approach to problems of plane plastic strain is illustrated by re-examination of the classical work of Prandtl on indentation. 14 ref.

24A-58. The Distribution of Stress in the Neighborhood of a Crack. T. J. Willmore. *Quarterly Journal of Mechanics and Applied Mathematics,* v. 2, Mar. 1949, p. 53-63.

Determines by complex-variable

methods the above distribution in the neighborhood of a two-dimensional Griffith crack when pressure varies along the crack. The analysis is extended to deal with problems involving cracks in aeolotropic materials possessing two directions of elastic symmetry. Stress distribution in the neighborhood of two collinear cracks of equal length; formulas for shape of the cracks and critical tensile stress normal to the cracks which will produce rupture.

24A-59. Using Head Shapes to Cut Costs. Herbert A. Ottey. *Product Engineering,* v. 20, Apr. 1949, p. 81-85.

Varied applications of tank heads, or head shapes, for simpler construction of machine elements wherever all or a portion of the element is in the form of a surface of revolution. These are made by hot or cold forming or spinning.

24A-60. The Design of Surface Broaches. II. Artur Schatz. *Machinery,* v. 55, Apr. 1949, p. 138-145.

Effect of such factors as type of machine used, machining operation, and methods employed in making the broach.

24A-61. Composite Dimensioning for Concentricity. J. T. Bennett. *Machinery,* v. 55, Apr. 1949, p. 153-155.

Incorporating diametral and eccentricity tolerance in one dimension results in increased production and fewer rejected parts.

24A-62. Plastic Buckling of Simply Supported Compressed Plates. Richard A. Pride and George J. Heimerl. *National Advisory Committee for Aeronautics,* Technical Note No. 1817, Apr. 1949, 22 pages.

Validity of various theories was investigated by means of local-instability tests on drawn square tubes of 14S-T6 Al alloy. Results obtained were in excellent agreement with Stowell's unified theory for plastic buckling of columns and plates. Two other theories of the deformation type and the empirical secant-modulus method also gave close correlation with results, but a plastic-buckling theory of the flow type showed lack of agreement. 11 ref.

24A-63. Metal Parts for Solid Propellant Rockets. L. G. Bonner. *Journal of the American Rocket Society,* Mar. 1949, p. 9-15.

Work which needs to be done on problems of design and fabrication. Problems result from emphasis on minimum weight and the exceedingly short total useful life of the assembly. Materials, Al alloys, and design.

24A-64. What Goes on in a Spring During Presetting? *Mainspring,* v. 12, Apr. 1949, p.1-5.

On many compression springs the last operation before shipping is "pre-setting"—performed by compressing and releasing the spring a few times to prevent it from taking permanent set on use. In some cases the load limit is raised as much as 30%. Simplified explanation of the theory behind this effect.

24A-65. Concerning Plastic Bending. (In Russian.) V. P. Romanovskii. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1456-1461.

A theoretical analysis of the state of stress during plastic bending. Formulas for accurate calculation of bending moments. Application of these formulas, taking into consideration the displacement of the neutral layer, is of value for determination of permissible radii of bending.

24A-66. New Method for Plotting Diagrams of True Stresses. (In Russian.) A. I. Chipizhenko. *Zavodskaya Laboratoriya* (Factory Laboratory), v. 14, Dec. 1948, p. 1469-1475.

Method which, in common with usual methods, expresses plasticity of metals on the basis of reduction in area of the test specimen. However, it permits establishment of new relationships and more correct evaluation of states and properties of the investigated metal. Theoretical bases.

24A-67. (Book.) **Diamond Tool Patents. III. Truing of Grinding Wheels.** W. Jacobsohn. 88 pages. Industrial Diamond Information Bureau, Industrial Distributors (Sales) Ltd., London.

Contains 500 abstracts of British, American, and German patents referring to design, arrangement, or use of particular truing devices. Compilation is limited to the years 1916 to 1946.

24A-68. A New Approach to the Design of Dynamically Loaded Extension and Compression Springs. Curt I. Johnson. *Transactions of the American Society of Mechanical Engineers,* v. 71, Apr. 1949, p. 215-223; discussion, p. 223-226.

Formulas and derivations which permit straightforward solution of spring problems with minimum assumptions. It is based upon a new method of graphical representation of spring characteristics. A method of cataloging stock springs.

24A-69. Stress Investigations in Gas Turbine Discs and Blades. S. S. Manson. *SAE Quarterly Transactions,* v.

3, Apr. 1949, p. 229-239.

Results of an investigation to measure the operating temperatures in a disk of a typical gas turbine engine. Data used to determine operating stresses and their implications on disk bursting, rim cracking, and inner-region cooling. Temperature distributions and vibrational stresses in a typical gas-turbine engine. Vibration was present, excited mainly by nozzle vanes and combustion chambers.

24A-70. You Pick the Winner! Frank C. Cech. *Foundry,* v. 77, May 1949, p. 168-170, 172.

Some of the entries in the A.F.S. patternmaking contest.

24A-71. Improving Bolt Performance. Arthur R. Anderson. *Product Engineering,* v. 20, May 1949, p. 109-111.

Photoelastic investigation of stresses in bolts shows that stress concentration can be reduced significantly by modifying the contour between bolt head and bolt body, and by annular grooving. Stress patterns.

24A-72. Joining Sheet Metal Parts Without Fasteners. Erwin Rausch. *Product Engineering,* v. 20, May 1949, p. 122-123.

Various methods of attaching rods, tubing and sheet metal parts in permanent or temporary assemblies without using bolts, screws, or rivets.

24A-73. Pipe-Stress Analysis for Thermal Expansion. Simon W. Lewaren. *Oil and Gas Journal,* v. 47, May 5, 1949, p. 80, 82-84, 87-88.

Simple arithmetical and graphical method giving results well within allowable limits. Illustrates its use by several examples.

24A-74. Couplings for Built-up Crankshafts and Their Behavior Under Load. G. Simonetti. *Engineers' Digest,* v. 10, Apr. 1949, p. 133-134. Translated and condensed from *Tecnica Italiana,* v. 3, Sept.-Oct. 1948, p. 261-265.

When solid crankshafts are not possible, the sections must be joined by some type of coupling. Special type of coupling in which the flanged section fits completely within a recess in the web of normal thickness. This arrangement can be applied to any crankshaft type, so that an engine can be equipped either with a built-up or a solid crankshaft. Comparative stress analysis and static tests on this type and the usual type in a 12,000-hp. engine indicate that the new type is highly satisfactory.

24A-75. The Strength of Laminates and Sandwich Structural Elements. N. J. Hoff. "Engineering Laminates" (John Wiley & Sons, 1949), p. 6-88.

Fundamental, mathematical principles of stresses and strains; design of sandwich structures. 79 ref.

24A-76. Formularisation of Stress-Strain Curves; Application to Test Results on Certain Alloys. Doris Crowden. *Metal Treatment and Drop Forging,* v. 16, Spring 1949, p. 25-30, 37.

Method for the calculation of physical properties of certain alloys, exemplified by some magnesium-base alloys. Curves of the hyperbola type are considered. A subsequent article will deal with the parabola and ellipse. (To be continued.)

24A-77. Stress Distribution Near Reinforced Circular Hole Loaded by Pin. Samuel Levy and Frank C. Smith. *Journal of Research of the National Bureau of Standards,* v. 42, Apr. 1949, p. 397-404.

Theoretical analysis and comparison of theoretical with experimental results for a plate of sandwich construction.

24A-78. Rubber Bonded to Metal Rapidly Becoming a "Production Tool". William A. Keetch. *Steel,* v. 124, May 16, 1949, p. 82-85, 116.

A variety of applications of rubber-metal composites in engineering design.

24A-79. (Book) **Engineering Laminates.** Albert G. H. Dietz, editor. 797 pages. 1949. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y.

Consists of 22 chapters. Includes composites of essentially all one class of material such as wood or metal, composites of several widely different materials such as plastic or rubber and fabric, composites essentially the same density throughout, and composites of lightweight cores and denser stronger skins commonly referred to as sandwich structures. Decorative laminates and laminates in which the surface material is essentially only a protective coating are excluded. Individual chapters dealing with metallic or partly metallic laminates are abstracted separately.

24A-80. (Book) **A Metallurgical Study of German Aircraft Engine and Airframe Parts. Part II.** Charles A. Otto, editor. 110 pages. 1948. Kennedy Press, Ltd., 31 King St. West, Manchester, 3, and Bedford St., London, W.C.2, England. 10s, 6d.

The material is classified by parts; i.e., a chapter on crankshafts, one on valve springs, etc. Composi-

tions and structures are described, and apparent methods of manufacture are indicated.

24A-81. Designing for Gas-Turbine Materials. M. H. Young. *Aeronautical Engineering Review,* v. 8, May 1949, p. 39-40. A condensation.

Previously abstracted from *Aviation Week,* item 24A-53, 1948.

24A-82. Some Aspects of Propeller Fatigue Testing. G. C. I. Gardiner. *Aircraft Engineering,* v. 21, May 1949, p. 149-152.

Practical application of results of fatigue testing to design of components.

24A-83. Application of Fatigue Data to Machine Design. R. E. Peterson. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 60-78.

Size-effect problem.

24A-84. Analysis of Stress in Aircraft Engines. William T. Bean, Jr. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 100-123.

Design, material, and load analysis. 13 ref.

24A-85. Design for Energy Absorption. Wendell P. Roop. *American Society for Metals,* "Properties of Metals in Materials Engineering", 1949, p. 140-170.

Quality-control design for ductility, load, cushioning and overload, monotonic loading, limits of plastic response, ductility measured by energy absorption, energy absorption and geometry, and design for energy absorption. 13 ref.

24A-86. The Influence of Manufacturing Accuracy on Additional Stresses. F. Salzmann. *Escher Wyss News,* v. 19-20, 1946-47, p. 86-89.

In machine components subjected to tensile or compressive loads, slight deviations from the correct geometrical form can be the cause of considerable additional bending stresses. Analyzes slightly bent bar subjected to tensile load; tube of noncircular cross-section stressed by internal pressure, and cylindrical tube subjected to axial tension, with slight deviation of the meridian from a straight line.

24A-87. Werkstoff- und Gestaltungsprobleme bei Dampf- und Gasturbinen. (Material and Design Problems of Steam and Gas Turbines.) H. Niermeyer. *Archiv fur Metallkunde,* v. 2, Oct. 23, 1948, p. 145-154.

An illustrated review. 72 ref.

24A-88. Designing for Lower Costs. *Product Engineering,* v. 20, June 1949, p. 81-168.

Introductory article, "Designing for Quality at Lower Costs", by O. A. Wheelon, and a series of graphs showing unit costs for Al and Mg-alloy castings, Mg-alloy and steel forgings and forging dies. Then specific cases, materials and construction; assembly methods; machine elements; electrical equipment; hydraulics and pneumatics; finishes; and standardization. Under "Materials and Constructions," design and applications are emphasized. "Assembly Methods" cites several applications of fasteners, welding, and brazing. "Finishes" describes several metal-finishing processes and applications.

24A-89. Belleville Spring Design Charts. IV. Leslie W. Jones. *Product Engineering,* v. 20, June 1949, p. 181, 183.

Nomographic charts for 60 and 75% pressure drops.

24A-90. Helpful Hints for the Engineer on Jig and Fixture Design. P. H. Winter. *Production Engineering & Management,* v. 23, June 1949, p. 56-58.

Use of simplified formulas enables design engineers to eliminate unnecessary weight on jigs and fixtures and still obtain dependable results.

24A-91. Interchangeable Tolerances—Arbitrary or Natural? Dorian Shainin. *Machine Design,* v. 21, June 1949, p. 130-134.

Previously abstracted from *SAE Journal,* item 24A-36, 1949.

24A-92. The Treatment and Properties of Springs. B. Coates. *Journal of the Birmingham Metallurgical Society,* v. 29, Mar. 1949, p. 21-39; discussion, p. 40-49.

Types of springs; materials used; physical properties; heat treatment; surface finish; and special coatings and finishes.

24A-93. Elastic Buckling of a Simply Supported Plate Under a Compressive Stress That Varies Linearly in the Direction of Loading. Charles Libove, Saul Ferdman, and John J. Reusch. *National Advisory Committee for Aeronautics,* Technical Note 1891, June 1949, 33 pages.

Results of calculations for plate of uniform thickness subjected to unequal compressive stresses at two opposite edges with a linear variation of stress between.

24A-94. (Book) **Mathematical Theory of Elasticity.** Ed. 4, rev. A. E. H. Love. 643 pages. Dover Publications, 1780 Broadway, New York 19, N. Y. $5.95.

Practical applications and a thorough, rigorous discussion of fundamental concepts. Analysis of strain and stress, elasticity of solid bodies, equilibrium of isotropic elastic solids, elasticity of crystals, vibration of spheres and cylinders, propagation of waves in elastic solid media, torsion, theory of continuous beams, and theory of plates.

24A-95. (Book) **Strength of Materials.** C. O. Harris. 212 pages. American Technical Society, Drexel Ave. at 58th St., Chicago 37, Ill. $4.90.

Strength of materials, prepared both for engineering students and for industry personnel. Stresses in beams, strengths of various types of joints, compression factors, fatigue in metals and other topics.

24A-96. (Book) **Elements of Strength of Materials.** Ed. 2. S. Timoshenko and Gleason H. MacCullough. 371 pages. 1948. D. Van Nostrand Co., 250 Fourth Ave., New York 3, N. Y.

Designed as a textbook for undergraduates. Determination of tensile and compressive stresses with temperature change in simple statically indeterminate structures. Double integration and area-moment methods for solving problems in deflection of beams.

24A-97. (Book) **Einfuhrung in die Festigkeitslehre fur Studierende des Bauwesens.** (Introduction to the Theory of the Strength of Materials for Students of Civil Engineering.) Ed. 3, rev. Fritz Chmelka and Ernst Melan. 304 pages. 1948. Springer-Verlag, Vienna, Austria.

24A-98. Thermal Stresses in a Rectangular Plate Clamped Along an Edge. B. J. Aleck. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), June 1949, p. 118-122.

A mathematical analysis. Applications are bi-material constructions, where the stiffnesses of the components are not of the same order of magnitude, and the coefficients of expansion are different. Examples are thin layers of plastic bonded to metal, and thin glazes on ceramic tiles. Brittle lacquers in experimental stress-analysis are often subjected to a similar state of stress.

24A-99. Dynamic Capacity of Rolling Bearings. Gustaf Lundberg and Arvid Palmgren. *Journal of Applied Mechanics,* v. 16 *(Transactions of the American Society of Mechanical Engineers,* v. 71), June 1949, p. 165-172. Condensed from *Acta Polytechnica* (Mechanical Engineering Series), v. 1, no. 3, 1947.

Comprehensive theory for fatigue failure in rolling bearings. The character of the failures is analyzed, and effect of the volume of stressed material is assessed by means of a modification of Weibull's statistical theory. Variables affecting bearing capacity and general formulas relating the variables to the capacity. Unknown exponents were evaluated experimentally and final formulas compared with results.

24A-100. The Effect of Fit and Truncation on the Strength of Whitworth Threads Under Static Tension. C. W. Smith and A. C. Low. *Machinery* (London), v. 74, June 16, 1949, p. 817-823.

Experimental work to determine whether or not a design change made to facilitate U. S. production of the threads had any serious effect on strength. The decrease in strength does not appear to be excessive.

24A-101. Die Grenzzustände statisch beanspruchter Stoffe. (The Limiting States of Statically Stressed Materials.) (Concluded.) C. Torre. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 15, May 1949, p. 145-158.

A mathematical method for determining the above, including the mechanics of limiting stresses, the true limiting curve, and calculation of the slip-band regions. 39 ref.

24A-102. Experimentelle Ermittlung der statischen Zugkraftverteilung der Niete in Knotenpunkten bei einreihiger Nietung. (Experimental Determination of Tensile Strength Distribution of Rivets at Nodal Points of a Single Row of Rivets.) E. von Burg. *Schweizer Archiv fur angewandte Wissenschaft und Technik,* v. 15, May 1949, p. 137-145.

Test arrangement and measuring method are described and results evaluated from the standpoint of the designer of riveted structures.

24A-103. Significant Stress and Failure in Static and Fatigue Loading. Charles Lipson, G. C. Noll, and L. S. Clock. *Product Engineering,* v. 20, July 1949, p. 130-135.

Effects of type and mode of loading on significant stress as related to failure of machine parts, and the effect of abrupt changes in shape on stress distribution. Factors for geometric stress concentration, fatigue-stress concentration, and notch sensitivity are evaluated in terms applicable to the determination of design stresses for finite and infinite life.

24A-104. How to Design Links and Clevises. *Welding Journal,* v. 28, July 1949, p. 675-677.

Large number of diagrams for welded design.

24A-105. Designing for Welding. Part VII. Wallace A. Stanley. *Welding Journal,* v. 28, July 1949, p. 677-678.

As applied to seam welding.

24A-106. Plastic Bending of Wide Flange Beams. W. A. Andrews. *Welding Journal,* v. 28, July 1949, p. 309s-310s.

The possibilities of utilizing the strength of structural members beyond the elastic range are analyzed mathematically.

24A-107. Car-Body Construction—A Rational Approach. *Light Metals,* v. 12, July 1949, p. 359-361.

Planned joint use of aluminium and steel in Armstrong Siddeley cars (British).

24A-108. Mechanical Fasteners—Their Selection and Use. N. Bruce Bagger. *Materials & Methods,* v. 30, July 1949, p. 71-82.

Six basic categories of permanent and semi-permanent fastening devices, not from the standpoint of installation techniques, but from that of the relative behavior they, and the materials from which they are made, exhibit for fastening applications. Much information concerning selection of materials and designs.

24A-109. Design of Aircraft Structures for "Mass Production". O. A. Wheelon. *SAE Quarterly Transactions,* v. 3, July 1949, p. 480-488; discussion, p. 488-489.

Examination of cost factors and the distribution of costs at various quantities shows the relative importance of each. The principles of design producibility are shown to be directed toward minimizing tooling and manufacturing problems. Material and assembly problems. Selection of metals and alloys and of their fabrication. (See abstract of condensed version from *SAE Journal.*)

24A-110. Contact Stress Concentration. R. Howard. *Machinery* (London), v. 75, July 7, 1949, p. 16-17.

Design of roller bearings, cams, and gear teeth to avoid high contact stress concentrations with their accompanying tendency toward fatigue failure. Tapering toward the ends is the usual design technique used. How this form (known as "crowning") is produced.

24A-111. How To Calculate Blanks for Seamless Rectangular Shells. Sergius D. Brootzkoos. *American Machinist,* v. 93, July 28, 1949, p. 67-71.

Sloping curves for corners of the blanks are usually approximated. A Russian method that is geometrically exact and which avoids folds, tears, or excessive thickening.

24A-112. Pointers for Lower-Cost Designs. *American Machinist,* v. 93, July 28, 1949, p. 121.

Castings, moldings, punchings, formed parts, fabricated parts, machined parts, screw-machine parts, welded parts, treatments and finishes, and assemblies.

24A-113. Formularisation of Stress-Strain Curves; Application to Test Results on Certain Alloys. Doris Crowden. *Metal Treatment and Drop Forging,* v. 16, Summer 1949, p. 121-128, 130.

In a previous issue, the author gave a method for the calculation of physical properties of certain metals, as typified by Mg-base alloys, using a curve of the hyperbola type to represent stress-strain relationships. In this section, use of the parabola and ellipse and advantages which they sometimes possess.

24A-114. Thermal Stresses in Turbine Blades. M. J. Lighthill and F. J. Bradshaw. *Philosophical Magazine,* ser. 7, v. 40, July 1949, p. 770-780.

A theory is developed. Consequences of the theory are that on cooling, maximum stress occurs at all times near the position of maximum thickness, but that on heating, the largest stresses are initially near an edge, though their position moves along the blade towards the position of maximum thickness and their magnitude increases. Maximum stress is inversely proportional to thermal conductivity for the lower heat-transfer rates, but is less sensitive to it at higher rates. Application to sintered alumina and comparison with experiment.

24A-115. Effect of Fit and Truncation on the Strength of Whitworth Threads. C. W. Smith and A. C. Low. *Engineering,* v. 168, July 22, 1949, p. 93-95.

Previously abstracted from *Machinery* (London), item 24A-100, 1949.

24A-116. Honeycomb-Sandwich Structures. I. H. C. Engel and T. P. Pajak. *Product Engineering,* v. 20, Aug. 1949, p. 81-85.

Describes properties and applications of various designs and material types of the above. Mechanical properties of the panels. Core material may be resinous, fabric, paper, or metal foil. Sheet metal, or plywood, cotton, or glass fabric laminates may be used as face materials. Necessary adhesive properties. (To be concluded.)

24A-117. The Function of Interchangeability in Tool Engineering. G. H. Stimson. *Tool Engineer,* v. 23, Aug. 1949, p. 29-31.

Interchangeability of components —the basis of mass production which depends upon application of tolerances to dimensions and accurate control of dimensions within tolerance during production.

24A-118. Design of Broaching Fixtures. John A. Markstrum. *Tool Engineer,* v. 23, Aug. 1949, p. 32-35.

Requirements and qualities desired. Design problems encountered.

24A-119. (Book) **Strength of Materials. Ed. 1.** J. P. Den Hartog. 323 pages. 1949. McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y.

Designed for use in a first course for engineering students. Each chapter starts with general theory; then presents practical examples. Includes problems, complete with answers, at the end of the text. Tension, torsion, bending, compound stresses, deflections of beams, cylinders and curved bars, the energy method, buckling, and experimental elasticity.

24A-120. High Pressure. *Chemical Engineering,* v. 56, Aug. 1949, p. 107-123.

Designs and engineering used in today's high-pressure plants. Fabrication methods, metallurgical problems, and instrumentation. Restricted to equipment for pressures of 750 psi. and higher.

24A-121. Limits and Tolerances. *American Machinist,* v. 93, Aug. 25, 1949, p. 121, 123, 125.

Summary of the specification of limits and tolerances and methods of indicating them on drawings.

24A-122. Production Processes—Their Influence On Design. Part XLV. Sand Casting. Roger W. Bolz. *Machine Design,* v. 21, Aug. 1949, p. 127-140.

Design principles.

24A-123. Production—the Designer's Contribution. Part I. Principles of Efficient Production; Special Problems of Manufacture; Joining Processes. Frank Radcliffe. *Aircraft Production,* v. 11, July 1949, p. 241-245.

Manufacturing costs and the contribution that the designer can make to economy. Special problems of airframe manufacture and current British production practice. Possible future developments, both in design and manufacture. 12 ref. (To be concluded.)

24A-124. The Effect of Tolerances on Fits. J. Gilson. *Machinery* (London), v. 75, July 28, 1949, p. 119-124.

First of a series of four concerned with controversial aspects of the subject, primarily from the point of view of the producer and with particular reference to the manufacture of light engineering products. (To be continued.)

24A-125. Die Grenzzustände statisch beanspruchter Stoffe. (Limiting States of Statically Stressed Materials.) C. Torre. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Apr. 1949, p. 116-121.

A theoretical treatise on limiting stresses, stress-expansion characteristics, spontaneous stress relief of the material, the mechanics of elastic-plastic and purely plastic deformations, and the different types of stress. (To be concluded—see item 24A-102, 1949.)

24A-126. Beanspruchung bei mehrfacher Kerbwirkung, Entlastungs- und Ueberlastungskerben. (Stress With Multiple Notches, Stress-Decreasing and Stress-Increasing Notches.) A. Thum and O. Svenson. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, June 1949, p. 161-174.

The complex effects of more than one notch on the strength properties of structural parts. 13 ref.

24A-127. Die Wirkung von Kerben bei schwingender Beanspruchung. (The Effect of Notches During Application of Vibrating Stress.) E. Siebel and H. O. Meuth. *Zeitschrift des vereines Deutscher Ingenieure,* v. 91, July 1, 1949, p. 319-323.

A working hypothesis for the strength behavior of unequally stressed structural parts, subjected to alternating multiaxial stresses, and a method for calculating the stress-strain gradient of notched steel bars.

24A-128. Press Fit Seals for Ball and Roller Bearings. E. P. Stahl. *Iron Age,* v. 164, Sept. 8, 1949, p. 69-74.

Various springless and spring-loaded unit oil and grease seals that can be press fitted without counterboring. Miscellaneous applications.

24A-129. How Codes Affect Pressure Vessel Design. Neil Osborn. *Machine Design,* v. 21, Sept. 1949, p. 105-106.

Requirements of the various agencies, including those responsible for codes.

24A-130. Accurate Calculation of Static Bending Strength. Stanley J. Weiss. *Product Engineering,* v. 20, Sept. 1949, p. 94-97.

Theory of limit design, which considers yielding of the material and determines the static strength of

flexural members more accurately than standard stress-analysis procedures. Application to members subject to both axial load and bending moment.

24A-131. Effect of Tolerance Accumulation on Assemblies. J. Gilson. *Machinery* (London), v. 75, Aug. 11, 1949, p. 188-191.

A mathematical analysis of the probable variation in an assembly dimension controlled by a number of individual tolerances.

24A-132. The Forming of a Plastic Sheet Between Fixed Cylindrical Guides With Coulomb Friction. H. I. Ansoff. *American Society of Mechanical Engineers,* Paper no. 49-SA-22, June 1949, 20 pages.

An investigation to obtain a rigorous analysis of the drawing of a plastic sheet (material in a state of plane plastic flow) between two fixed cylindrical surfaces. 10 ref.

24A-133. Primary Creep in the Design of Internal-Pressure Vessels. L. F. Coffin, Jr., P. R. Shepler, and G. S. Cherniak. *Journal of Applied Mechanics,* v. 16 (*Transactions of the American Society of Mechanical Engineers,* v. 71), Sept. 1949, p. 229-241.

Previously abstracted from *American Society of Mechanical Engineers,* Advance Paper No. 48-PET-18. See item 24a-239, 1948.

24A-134. The Theory of Plane Plastic Strain for Anisotropic Metals. R. Hill. *Proceedings of The Royal Society,* ser. A, v. 198, Aug. 22, 1949, p. 428-437.

A yield criterion and plastic stress-strain relations are formulated for anisotropic metals, deformed under conditions of plane strain. Theory is applied to the problem of indentation by a flat die.

24A-135. The Treatment and Properties of Springs. B. Coates. *Wire Industry,* v. 16, Aug. 1949, p. 645-647, 649; discussion, p. 649-651.

Previously abstracted from *Journal of the Birmingham Metallurgical Society.* See item 24A-92, 1949.

24A-136. Theory and Tests on the Plastic Stability of Plates and Shells. P. P. Bijlaard. *Journal of the Aeronautical Sciences,* v. 16, Sept. 1949, p. 529-541.

Assuming that plastic deformation is governed only by the amount of elastic shearing energy at the point in question, it is shown that the assumption of "plastic deformation" leads to smaller buckling stresses than that of "plastic flow". Using the assumption of "plastic deformation", it is found that the theory is in good agreement with tests by Kollbrunner and by NACA. Compares theory with those of Ilyushin, Stowell, and Handelman and Prager. 46 ref.

24A-137. Design of Prestressed Shells for Pressure Vessels. R. R. Maccary and R. F. Fey. *Chemical Engineering,* v. 56, Sept. 1949, p. 105-107, 111.

Second of three articles presents calculation method, graphs, and diagrams.

24A-138. Direct Method of Design and Stress Analysis of Rotating Disks With Temperature Gradient. S. S. Manson. *National Advisory Committee for Aeronautics,* Technical Note 1957, Oct. 1949, Washington, 31 pages.

A method is presented for determination of contour of disks, typified by those of aircraft gas turbines, to incorporate arbitrary elastic-stress distributions resulting from either centrifugal or combined centrifugal and thermal effects. Octahedral shear stress is used as the design criterion.

24A-139. The Behaviour of Continuous Stanchions. J. F. Baker, M. R. Horne, and J. W. Roderick. *Proceedings of the Royal Society,* ser. A, v. 198, Sept. 7, 1949, p. 493-509.

Tests on small-scale steel beams of rectangular and I-beam section subjected to load arrangements encountered in building structures. A theoretical explanation of the results is sought by reference to the simple plastic theory in which it is assumed that sections plane before bending remain plane after bending. The theory of members subjected to combined bending and axial load in the partially plastic range is developed, and applied to the case of single curvature beams. The growth of the plastic zones is traced and satisfactory agreement obtained between theoretical and observed collapse load. An improved theory is applied to double-curvature bending.

24A-140. Graphical Analysis of Impact of Bars Above the Elastic Range. K. J. DeJuhasz. *Engineering Experiment Station, Pennsylvania State College,* Bulletin No. 60, 1949, 64 pages. Reprinted from *Journal of the Franklin Institute,* v. 248, July 1949, p. 15-48; Aug. 1949, p. 113-142.

Previously abstracted from original. See item 3A-184, 1949.

24A-141. (Book) **Structural Design in Metals.** Clifford D. Williams and Ernest C. Harris. 596 pages. Ronald Press Co., 15 East 26th St., New York. $6.50.

Emphasis on the design of details rather than on the complete structure. An attempt is made to analyze both welded and riveted details in

each phase of work. Six appendices contain standard specifications and codes.

24A-142. Stress-Strain Relations for Uniform Monotonic Deformation Under Triaxial Loading. J. H. Palm. *Applied Scientific Research,* v. A2, no. 1, 1949, p. 54-92.

A simple theory for the above. Suggests that a principal strain may be composed of two partial strains, each of which is exclusively a function of the corresponding principal shear stress. The theory yields results which agree on the whole as well or better with available experimental results than does the more complicated octahedral theory based on the Huber-von Mises-Hencky criterion. 22 ref.

24A-143. Stress-Strain Relations and Necking Criteria for Triaxial Loading, Two Principal Stresses Being Equal. J. H. Palm. *Applied Scientific Research,* v. A1, no. 5-6, 1949, p. 353-377.

A mathematical analysis of the problem. Continuation of work described in a previous paper (see item 9-12, 1949).

24A-144. The Science of Valve Making. *Chemical and Engineering News,* v. 27, Oct. 24, 1949, p. 3132-3133.

Picture story shows equipment and procedures of laboratory devoted entirely to study of the design and building of steel valves. A prime objective is production of valves with a minimum of corrosion or erosion characteristics and with low pressure drop.

24A-145. Practical Design of Prestressed Pressure Vessel Shells. R. R. Maccary and R. F. Fey. *Chemical Engineering,* v. 50, Oct. 1949, p. 120-123.

Design criteria for various forms of construction which approach the ideal prestress pattern. Derives law to be followed in applying prestressed layers of any form, so that uniform tension will be achieved under pressure.

24A-146. Genaue Berechnung der Eigenspannungen in oberflächengedrückten Stäben von kreisförmigem Querschnitt. (Accurate Calculation of Internal Stresses in Surface-Stressed Round Bars.) O. Föppl. *Schweizer Archiv für angewandte Wissenschaft und Technik,* v. 15, Aug. 1949, p. 242-248.

Details of calculation, illustrated by graphs and diagrams.

24A-147. Form- und giessgerechte Konstruktion und deren Einfluss auf die Preisgestaltung der Gussstücke. (Proper Designs and Their Effect on the Cost of Castings.) J. H. Küster. *Die Neue Giesserei,* v. 36 (new ser., v. 2), Sept. 1949, p. 260-264.

Methods of simplifying the designs of castings in order to reduce costs.

24A-148. Retaining Bearings by Swaging. C. H. Avery and A. G. Brisack. *Iron Age,* v. 164, Nov. 3, 1949, p. 79-82.

Development of new bearing-retention techniques has resulted in weight reductions in aircraft bearing assemblies. Experiments on ferrous and nonferrous metals have resulted in a swaging technique that reduces the section thickness of bearing housings without affecting thrust load capacities, and yields cost savings in parts and assembly.

24A-149. The Distribution of Load in Screw Threads. D. G. Sopwith. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 45, p. 373-383; discussion, p. 391-398.

Strains are analyzed and load distribution along the thread helix deduced. Possible methods of improving load distribution and effect of yielding. Experimental confirmation of some of the results is included.

24A-150. Tensile Fillet Stresses in Loaded Projections. R. B. Heywood. *Institution of Mechanical Engineers, Proceedings,* v. 159, War Emergency Issue No. 45, 1948, p. 384-391; discussion, p. 391-398.

Existing fillet-stress formulas give accurate results over only a narrow range of projection shapes. An empirical formula is advanced which agrees well with experiment over a wide range of projection shapes, and which provides a powerful method of determining the strongest shape of projection for any given purpose. The procedure is demonstrated for a series of screw-thread forms.

24A-151. Critical Shear Stress of a Curved Rectangular Panel With a Central Stiffener. Manuel Stein and David J. Yaeger. *National Advisory Committee for Aeronautics,* Technical Note 1972, Oct. 1949, 19 pages.

A theoretical solution is given for the above, having no torsional restraint in either the axial or circumferential direction. Results were obtained by the Galerkin method.

24A-152. Plastic Distortion of Non-Uniform Sheets. R. Hill. *Philosophical Magazine,* ser. 7, v. 40, Oct. 1949, p. 971-983.

A mathematical analysis.

24A-153. Aluminum-Iron Drum Boosts Vehicle Brake Performance. *SAE Journal,* v. 57, Nov. 1949, p. 56-61. Based on paper "Design and Development Considerations of a Bimetallic Brake Drum" by Charles E. Stevens, Jr. (To

be printed in full in *SAE Quarterly Transactions.*)

Advantage is due to efficient dissipation of frictional heat, thus minimizing lining failures. After developing a design that combined good heat transfer with ability of the bond to withstand thermal stresses, the drums were tested on a dynamometer, then in a midget racing car, finally in a medium-sized bus.

24A-154. Bimetal Brake Drums; A Study of the Heat Stresses in Thin Cylinders. G. A. G. Fazekas. *Automobile Engineer,* v. 39, Oct. 1949, p. 394-396.

Derivation and graphical representation of design formulas. Application to an example in which an Al alloy sheet is bonded to a cast iron liner.

24A-155. Critical Stress of Ring-Stiffened Cylinders in Torsion. Manuel Stein, J. Lyell Sanders, Jr., and Harold Crate. *National Advisory Committee for Aeronautics,* Technical Note 1981, Nov. 1949, 17 pages.

A nondimensional chart is presented for the theoretical critical stress in torsion of simply supported cylinders stiffened by identical, equally spaced, torsionally weak rings. Results are obtained by solving the equation of equilibrium by the Galerkin method. Comparison of theoretical with experimental results indicates that ring-stiffened cylinders buckle, on the average, at a stress about 15% below the theoretical buckling stress.

24A-156. Mechanics of Elastic-Ductile-Plastic Bodies. III. Torsion in Cylinders. (In Russian.) A. I. Gubanov. *Zhurnal Tekhnicheskoi Fiziki* (Journal of Technical Physics), v. 19, July 1949, p. 773-781.

A mathematical analysis. Formulas are proposed for determination of torsion at a given angle of torque and are interpreted for different values of variables. Possibility of application of the equations to other torsion problems.

24A-157. (Book) **Analytical Mechanics of Gears.** Earle Buckingham. 546 pages. 1949. McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. $10.00.

Conjugate gear-tooth action, nature of contact, and resulting gear-tooth profiles. Closing chapters analyze gear teeth in action. Discussions include frictional heat of operation and its dissipation, friction losses and efficiencies, dynamic loads in operation, beam strength or resistance of teeth to breakage and fatigue, surface-endurance limits of materials, and limiting wear loads or potential resistance to surface disintegration and excessive wear.

24A-158. Eleven Ways To Use Die Springs. J. R. Paquin. *American Machinist,* v. 93, Dec. 1, 1949, p. 108-110.

How to avoid trouble in common applications, and to devise correct solutions for unusual problems in forming-die design.

24A-159. Check List for Die Designers. E. Rausch. *American Machinist,* v. 93, Dec. 1, 1949, p. 110.

Refers to forming-die design.

24A-160. Tools of Design. William H. Browne. *Metals Review,* v. 22, Nov. 1949, p. 4-6.

Recent developments in design techniques, materials, testing techniques, and production procedures. (References to "A.S.M. Review of Current Metal Literature".)

24A-161. How Plastic Deformation Influences Design and Forming of Metal Parts. Part 1. True Stress-Strain and Initial Plastic Flow. Part 2. Plastic Flow and Rupture of Metals. John R. Low, Jr. *Materials & Methods,* v. 30, Nov. 1949, p. 47-51; Dec. 1949, p. 59-63.

Simple explanation of plastic flow in metals and how application of present knowledge on the subject can be used to advantage in the design and production of metal products.

24A-162. The Design and Fabrication of Welded Structures Subjected to Repeated Loading. Part III. R. Weck. *Welder,* v. 18, July-Sept. 1949, p. 61-66.

Effect of notches on fatigue strength; and influence of the stress gradient. Summarizes basic facts on the fatigue of metals.

24A-163. The Icosasphere, A New Spherical Tank Layout. J. O. Jackson. *Iron Age,* v. 164, Nov. 17, 1949, p. 92-94.

Method of designing and building welded spherical tanks and other double-curved plate surfaces which gives reduction in scrap loss and welded footage.

24A-164. Design Considerations for Manufacturing Economy. Roger W. Bolz. *Mechanical Engineering,* v. 71, Dec. 1949, p. 1004-1010.

Possibilities of achievement of large savings by redesign and change of process.

24A-165. Maximum Design Load vs. Temperature for Springs. O. G. Meyers. *Product Engineering,* v. 20, Dec. 1949, p. 161.

Curves for six common spring alloys.

24A-166. Basic Rules Govern Welding Fixture Design. *American Machinist,* v. 93, Dec. 15, 1949, p. 82-85.

Thirteen rules to observe followed by practical examples.

24A-167. Relation of Experiments to Mathematical Theories of Plasticity. D. C. Drucker. *Journal of Applied Mechanics,* v. 16 (*Transactions of the American Society of Mechanical Engineers,* v. 71), Dec. 1949, p. 349-357.

Several classes of mathematical theories of plasticity for work hardening materials are surveyed for their advantages, disadvantages, and agreement with experiment. Proper correlation of tests on thin-walled tubes subjected to tension, torsion, and internal pressure in fixed but arbitrary ratio. The concept of isotropic work hardening, assumed in practically all stress-strain relations. 17 ref.

24A-168. Safety Factors in Screw Thread Assemblies. Howard L. Hopkins. *Fasteners,* v. 6, no. 2, 1949, p. 13-16.

Tensile-test results indicate that large safety factors exist. Because of this fact, small fastener defects have no appreciable effect on stress characteristics of the assembly. Effects of the change from American standard to unified threads were also found to be insignificant.

24A-169. Designing Metal Parts for High Temperature Service. F. G. Sefing. *Canadian Metals and Metallurgical Industries,* v. 12, Nov. 1949, p. 14-17, 36.

Various factors involved, giving specific examples and mechanical properties of common metals and alloys. 16 ref.

24A-170. Metallic Noise. D. H. Lloyd. *Metal Industry,* v. 75, Oct. 28, 1949, p. 371-375; Nov. 4, 1949, p. 391-393; Nov. 11, 1949, p. 419-421; Nov. 18, 1949, p. 436-438, 444; Nov. 25, 1949, p. 455-457, 461; Dec. 2, 1949, p. 479-481.

Fundamental principles responsible for the production of noise by metallic objects and structures. Also describes principles of damping, which, it is said, may be applied to design of noise-free metallic products such as car bodies, cabinets, sinks, refrigerators, washing machines, ash-trays, utensils, etc. Methods of application of coatings having damping properties.

24A-171. Stresses in Hot Metal Ladles. K. E. Knudsen, Wm. H. Munse, and B. G. Johnston. *Iron and Steel Engineer,* v. 26, Dec. 1949, p. 46-49; discussion, p. 69-70.

Extensive experimental and theoretical study using three 1/5-scale models of 150-ton prototypes. Mercury was used as the loading agent in most cases and strains were measured by resistance strain gages. Deflections were measured by dial gages. 14 ref.

24A-172. Fabricated Materials and Parts —a Comparison of Their Design and Production Factors. *Materials & Methods,* v. 30, Dec. 1949, p. 67-82.

Design, cost, and production features of small fabricated forms, and processes involved in their manufacture. Emphasis is on final form in which the various materials are to be used, rather than on processes of manufacture.

24A-173. Design of Fixture Elements. Clamps and Fixture Components. Hans W. Smith. *Tool Engineer,* v. 23, Dec. 1949, p. 34-37.

24A-174. Tank Plate Layout Method Materially Reduces Scrap Loss and Welding Time. *Steel,* v. 125, Dec. 19, 1949, p. 100, 103.

New method of predicting flow or displacement of materials in plates and sheets which are bent, formed, or drawn in such a manner that plastic flow occurs. Method is applicable to construction of spherical tanks and other double-curved plate surfaces.

24A-175. Leistungssteigerung an hochbelasteten Zahnrädern; Ein Beitrag zur Frage der Zahngestaltung. (Increasing the Efficiency of Highly Stressed Gear Wheels; a Contribution to the Problem of Tooth Design.) Heinz M. Hiersig. *Stahl und Eisen,* v. 69, Sept. 29, 1949, p. 695-701.

A type of tooth which permits large profile displacements without varying the original center distance. Efficiency compared with that of other types. 17 ref.

24A-176. (Book) **Machinery's Handbook. Ed. 14.** 1911 pages. 1949. Industrial Press, 148 Lafayette St., New York 13, N. Y. $7.00.

Basic information, data and formulas for use in designing or building any type of machine or other mechanical device. Contains the unified and American Standard Screw Thread System. Revised sections on broach design, electric motors, worm gearing, roller chains, standard iron and steel compositions and applications, carbide tools, grinding wheels and abrasives.

24A-177. (Book) **Strength of Materials.** Gerner I. Olsen. 442 pages. 1949. Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y. $4.25.

Material is presented simply and directly, requiring no more mathematics than algebra. Emphasizes

practical use of the material. Principles of mechanics and fundamental stress and strain relationships. Chapters on thin-walled cylinders and spheres and riveted and welded joints, torsion, shear and bending moment diagrams, design and deflection of beams, statically indeterminate beams, stresses due to eccentrically applied loads, columns, combined stresses, and fatigue strength and stress concentrations.

B—Ferrous

24B-1. Welded Box Car Engineered for Mass Production and Lower Costs. J. E. Candlin, Jr., and C. G. Delo, Jr. *Steel,* v. 123, Dec. 20, 1948, p. 113-114, 116.

Design and methods of production.

24B-2. Selecting a Material to Do a Job. D. R. Meier and J. H. Crankshaw. *Foundry,* v. 77, Jan. 1949, p. 87, 214, 216-218.

Requirements to be met in design of malleable-iron products.

24B-3. La technique de l'emploi simultané de l'acier coulé et du soudage en construction mixte. (The Technique of Simultaneous Use of Cast Steel and Welding in Compound Structures.) H. Gerbeaux. *Soudure et Techniques Connexes,* v. 2, Sept.-Oct. 1948, p. 184-200.

Technique developed by the Welding Institute of France. Importance of development of a special type of steel for such structures, design of the components, and optimum welding conditions.

24B-4. Report of Committee 15—Iron and Steel Structures. E. S. Birkenwald and others. *American Railway Engineering Association, Bulletin,* v. 50, Jan. 1949, p. 423-451.

Includes the following subcommittee reports: revisions of specifications for steel railway bridges; stress distribution in bridge frames-floorbeam stringers; design of steel-bridge details; and design of metal culverts of 60-in. diam. and larger, including corrugated metal arches.

24B-5. Investigation Into the Behavior of Welded Frame Structures. Seventh Interim Report. Further Tests on Stanchions. J. F. Baker and J. W. Roderick. *Welding Research,* v. 2, (Bound with *Transactions of the Institute of Welding,* v.11), Dec. 1948, p. 110r-121r.

Single and double-curvature bending of I-sections. Tests were made exactly as described in earlier reports; beam loading was completed before an increasing axial load was applied to cause collapse.

24B-6. How to Design Wheels. *Welding Journal,* v. 28, Feb. 1949, p. 158-160.

Numerous welded-wheel designs illustrated and briefly described.

24B-7. Comparison of Web Stresses in 131-lb. RE and 140 PS—(Pennsylvania) Sections. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 558-566.

Stresses in the 140-PS rail-section design were determined in the laboratory and in service. Results indicate that this design, which replaces the 131-RE design, is satisfactory; and that laboratory stress measurements forecast the reduction in service stress with satisfactory accuracy.

24B-8. Service Tests of Manganese Crossings. *American Railway Engineering Association, Bulletin,* v. 50, Feb. 1949, p. 572-579.

Results of comparative tests of various designs of solid Mn-steel crossing frogs, tests of Mn-steel insert and solid Mn-steel crossings on structural steel and longitudinal timber supports, and tests of crossing frog-bolt tension.

24B-9. Spherical High Pressure Containers Meet Severe Service Requirements by Two-Piece Welded Construction. D. Mapes. *Steel,* v. 124, Feb. 21, 1949, p. 98-99.

Fabrication of containers for methyl bromide, when the latter is used as a fire-extinguishing agent for engines in certain types of aircraft. Design principles and manufacturing methods.

24B-10. Torsional Strength of Steel Tubing as Affected by Length. William Le Fevre, Jr. *Product Engineering,* v. 20, Mar. 1949, p. 133-136.

Results of torsional-strength tests for various wall thickness-diameter-length combinations.

24B-11. ASME Boiler Code. *Mechanical Engineering,* v. 71, Mar. 1949, p. 259-262.

Tables give maximum allowable design stresses for Ni and Ni alloys and charts for determining shell thicknesses of unfired cylindrical vessels of Monel, Inconel and nickel plate, SB-162.

24B-12. Tests of Large Welded-Steel Box Girders; Bending Tests at Different Temperatures. Ambrose H. Stang and Bernard S. Jaffe. *Welding Journal,* v. 28, Mar. 1949, p. 89s-97s.

Previously abstracted from *Journal of Research of the National Bu-*

reau of Standards. See item 24b-112, 1948.

24B-13. (Book.) **Design of Steel Buildings. Ed. 3.** Harold D. Hauf and Henry A. Pfisterer. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16.

Rewritten and brought up to date to conform with the 1946 revision of the American Institute of Steel Construction specifications. An expanded treatment of welded construction is also included.

24B-14. Recommended Practices for Staybolt Application and Maintenance. *Master Boiler Makers' Association, Official Proceedings,* 1948, p. 136-193.

Includes "Tools Used in Threading Thread Gages and Tolerances, Gaging Methods," G. R. Greenslade; "Seal Welding of Staybolts," E. E. Owens; "Specifications for Staybolt Iron, Solid and Hollow Rolled"; "Specifications for Boiler and Firebox Steel"; "Notes on the Design and Construction of Staybolted Locomotives," Fred P. Huston; "The Welding of Staybolts," by Howard L. Miller and L. E. Grant; and other items.

24B-15. Why Dies Break. David R. Edgerton. *Machine and Tool Blue Book,* v. 45, Apr. 1949, p. 123-126, 128, 130-134, 136.

Reasons for some failures, and recommendations for selection of materials, design of tools, and inspection procedures.

24B-16. Cost and Weight Advantages Obtained With a Welded Sheave. A. T. Scannell. *Machinery,* v. 55, Apr. 1949, p. 188.

60-in. diam. welded steel sheave is 60% lighter and 68% cheaper than a cast-iron sheave. Other advantages are greater safety, longer life, and elimination of maintenance work normally required.

24B-17. An Analysis of Blanking Die Designs. C. W. Hinman. *Modern Machine Shop,* v. 21, Apr. 1949, p. 134-136, 138, 140, 142.

Basic data on the construction of a simple blanking die.

24B-18. Significant Strength of Steels in the Design of Machine Parts. I. Charles Lipson, G. C. Noll, and L. S. Clock. *Product Engineering,* v. 20, Apr. 1949, p. 142-146.

Quantitative evaluation of the effect of individual factors on the determination of allowable strength to be used in design. Factors include static loading, alternating loading, combined loading, surface finish, and hardness. Construction of significant strength diagrams and their application to the different types of load. (To be continued.)

24B-19. Die Dauerfestigkeit von Schweissverbindungen als Berechnungsgrundlage fur geschweisste Brucken. (The Fatigue Strength Properties of Welded Joints as a Basis for Design of Welded Bridges.) Folkhard. *Schweisstechnik,* v. 2, Aug. 1948, p. 93-103.

A series of test results were analyzed to determine the factors that affect fatigue-stress resistance of welded joints and to find ways of increasing permissible stresses on welded bridges. 22 ref.

24B-20. An Investigation of the Stress-Strain Diagram at Low Temperatures. E. M. Shevandin. *Engineers' Digest,* v. 10, Jan. 1949, p. 7-10. Translated and condensed from *Zavodskaya Laboratoriya* (Factory Laboratory), v. 13, 1947, p. 858-870.

True-stress diagrams were obtained for eight steels by the usual method on a Gagarin press, with tensile-test specimens of normal shape. Low-temperature tests were made in a special tin vessel of tumbler shape with a thick flat bottom, possessing good thermal-insulation properties.

24B-21. Festigkeitsversuche an Eisenbahnwagen-Achsen als Grundlage fur deren Berechnung. (Strength-Tests of Railroad Car Axles as a Basis for Their Design.) E. Sperling. *Zeitschrift des Vereines Deutscher Ingenieure,* v. 91, Mar. 15, 1949, p. 134-136.

Forces acting on the axles during operation, their fatigue strength, and the notch effect at the hub and the angle formed by the wheel with the axle. New principles of design.

24B-22. Significant Strength of Steels in the Design of Machine Parts. II. Charles Lipson, G. C. Noll, and L. S. Clock. *Product Engineering,* v. 20, May 1949, p. 124-128.

Effects of cold working, surface hardening, and plating on the strength of materials used for machine parts. Relationship between fatigue strength and life expectancy in service, and a practical method of constructing diagrams for obtaining allowable stress values for any finite life.

24B-23. Laundry Machinery Redesigned for Welded Construction. Frank A. Gerlach. *Iron Age,* v. 163, May 5, 1949, p. 92-93.

Redesign of a dry-cleaning washer to permit use of welded-steel construction, which resulted in reduced manufacturing costs. Operating efficiency and appearance were im-

proved and weight was reduced.

24B-24. Testing Track Bolts. R. P. Winton. *Fasteners,* v. 5, no. 4, [1949], p. 14-19.

Test data on various types and sizes of bolts used on railroad track. Purpose of work, which was done by an ASA subcommittee, was to standardize on a minimum number of sizes.

24B-25. Notes on Alloyed Irons and Steels. J. George H. Thompson, editor. *International Nickel Co.,* July 1948, 40 pages.

Questions and answers concerning troublesome design cases as they actually arose in practice. Purpose is to give the student of machine design some training in the selection of materials and in considerations involved in making such selection.

24B-26. Evaluation of Effect of Residual Stresses. T. W. Greene. *Welding Journal,* v. 28, May 1949, p. 193s-203s; discussion, p. 203s-204s.

Welded test plates with reproducible defects such as notches were tested in the as-welded state and with low-temperature stress relieving and with furnace stress relieving by bending at different temperatures. Either type of stress-relieving appears to give considerable assurance against premature failure.

24B-27. How to Detail and Inspect Parts for Bolted Assembly. M. F. Spotts. *American Machinist,* v. 93, May 19, 1949, p. 124-125.

Several typical examples.

24B-28. (Book) Light Gage Steel Design Manual. 77 pages. 1949. American Iron & Steel Institute, 350 Fifth Ave., New York, N. Y. $1.00.

Supplements the Institute's official "Specification for the Design of Light Gage Steel Structural Members" published in 1946. Includes tables of structural properties and other design information for basic sections. Design charts are given for light gage structural members in bending and under compression; and for effective design widths for load determination and deflection determination. Examples of practical design problems.

24B-29. (Book) **Theory of Modern Steel Structures. Vol. II. Statically Indeterminate Structures and Space Frames.** Rev. Ed. Linton E. Grinter. 312 pages. 1949. Macmillan Co., 60 Fifth Ave., New York 11, N. Y. $5.25.

Engineering design principles are illustrated by problems for the student. Chapters on analysis and design of indeterminate structures; framed structures in space; deflections of structures; classical methods of analysis of indeterminate structures; analysis of continuous frames by moment distribution; analysis of continuous frames by balancing end angle changes; influence lines and maximum moment curves for continuous, movable and long-span bridges; and analysis of arches and closed rings.

24B-30. Welding as a Means of Economizing on Material and Labour in the Production of Machinery Structures. F. Koenigsberger. *Machinery* (London), v. 74, May 5, 1949, p. 587-591. A condensation.

Possible savings.

24B-31. Factors Influencing the Economic Design of Pressure Vessels. G. E. Fratcher. *American Society of Mechanical Engineers,* Preprint, 1948, 8 pages.

For welded fabrication. Points out the importance of materials and codes. Effect of addition of corrosion allowance.

24B-32. Surface Finish, Hardness and Life of Steel Parts. Charles Lipson. *Product Engineering,* v. 20, June 1949, p. 179.

Presents nomographic chart for anticipated service life of steel parts for any given design stress, hardness, and surface finish. Two examples.

24B-33. Liberty Ship Tailshaft Failures. *Journal of the American Society of Naval Engineers,* v. 61, May 1949, p. 506-508. Reprinted from *Marine Engineer,* Sept. 1948.

Modification to eliminate the cause of failures experienced in this design as a result of torsional vibration.

24B-34. A Survey of Car Body Production Methods at Vauxhall Motors Ltd. (Continued.) Maurice J. Seymour. *Sheet Metal Industries,* v. 26, May 1949, p. 1009-1013; June 1949, p. 1255-1258.

May issue, broad principles of the working of the die shop, and some of the problems encountered in the manufacture of large dies for contoured skin panels. June issue, a variety of problems connected with the manufacture, tryout, and maintenance of metal jigs and welding equipment used in mass producing the modern motor vehicle.

24B-35. Welded Steel Structures. Arsham Amirikian. *Welding Journal,* v. 28, July 1949, p. 629-639.

Past and present practice and future trends in design; the part played by research; fabrication

practice; prefabrication; and examples of modern framing.

24B-36. For Steel Tanks and Pressure Vessels—Minimum Thickness of Cylindrical Vessels. R. R. Maccary and R. F. Fey. *Petroleum Refiner,* v. 28, July 1949, p. 136-138.

Thicknesses obtained for many low-pressure applications by use of stress equations are considered too thin not only from a manufacturing standpoint, but also on the basis of inherent rigidity and stability.

24B-37. The Pressure Vessel Research Committee, 1946-49. *Welding Journal,* v. 28, Aug. 1949, p. 380s-384s.

Presents brief report of the work of the materials, design, fabrication, inspection and testing, and increased-design-stresses divisions. Details of work of design division at Purdue. Bibliography of reports issued by the committee during the above period.

24B-38. (Book) **Aluminum Structural Design.** Paul E. Brandt. 124 pages. Reynolds Metals Co., 2500 S. Third St., Louisville 1, Ky. No charge.

Includes chapters on figuring tensile stresses, compressive stresses, bending stresses, and shear stresses, as well as stresses in cylinders subjected to fluid pressure. Fabricating considerations and joining methods, including riveting, bolting, fusion welding, and spot welding. Additional chapters cover deflection and vibration problems.

24B-39. The Future of Structural Engineering in Relation to Steel Railway Bridges. Shortridge Hardesty. *Proceedings, American Railway Engineering Association,* v. 50, 1949, p. 877-881.

Bridge specifications, AREA-sponsored research, and the problems of fatigue and protection against corrosion.

24B-40. Effects of Sharp Radii and Other Features of Design. *BSFA Bulletin,* v. 1, April 1949, p. 1-7.

Provisions in design to prevent cooling from affecting the strength and soundness of steel castings.

24B-41. Experimental Investigation of Rim Cracking in Disks Subjected to High Temperature Gradients. P. I. Wilterdink. *National Advisory Committee for Aeronautics,* Research Memorandum E9F16, Sept. 1, 1949, 45 pages.

Investigation of cracking in a welded-blade composite gas-turbine wheel, in two carbon-steel disks, and in five toolsteel disks. In order to determine the effectiveness of holes in preventing crack propagation, ⅛ and $\frac{1}{16}$-in. diameter holes were drilled in the rim. The effectiveness of the holes in preventing crack growth was difficult to estimate accurately. Influence of hardness and various types of notch was investigated by subjecting 13.5-in. disks to thermal stress cycles.

24B-42. A Study of the Behavior of Floorbeam Hangers. Static and Dynamic Stress Measurements on the Illinois Central Railroad Bridge at Galena, Ill. L. T. Wyly, M. B. Scott, L. B. McCammon, and C. W. Lindner. *American Railway Engineering Association, Bulletin,* v. 51, Sept.-Oct. 1949, p. 51-73.

Results of static and dynamic tests using SR-4 resistance gages. Stresses were measured at 11 sections of each hanger, 228 gages being used for the static tests and 64 for dynamic tests. Purpose of the tests was to investigate the effects of form of hanger section, and of floorbeam and stringer deflection upon stress distribution in the hanger.

24B-43. Progress Report of Research Council on Riveted and Bolted Structural Joints. *American Railway Engineering Association, Bulletin,* v. 51, Sept.-Oct. 1949, p. 74-86.

The work is divided into 7 projects. Progress on effect of bearing pressure on static and fatigue strength of riveted joints; effect of rivet pattern on static strength of structural joints; fatigue strength of bolted structural joints; effect of grip upon fatigue strength of riveted and bolted joints; fatigue strength of high-strength steel riveted joints; and effect of rivet pattern on fatigue strength of structural joints. One project was inactive.

24B-44. Evolution of the Welded Box Car. L. E. Grant. *Welding Journal,* v. 28, Oct. 1949, p. 964-970.

Welding roof, ends, sides, and underframe.

24B-45. Analytical and Experimental Studies of Ladle Hooks. Carl W. Muhlenbruch. *Iron and Steel Engineer,* v. 26, Oct. 1949, p. 53-68, 70-71; discussion, p. 68-69.

Design and fastening method were studied by various test procedures, including strain-gage studies. Field tests were made on several types in order to determine effects of variations in design, method of fastening, and operating procedures. Types of riveted and welded joints. Resulting AISE design specifications.

24B-46. Steel Columns. A Survey and Appraisal of Past Works. A. A. Jakkula and Henson K. Stephenson. *Bulletin of the Agricultural and Mechani-*

cal College of Texas, ser. 5, v. 3, June 1, 1947 (Texas Engineering Experiment Station, Bulletin No. 91), 118 pages.

A bibliography of previous analytical and experimental works. Summarizes important tests, design procedures, and correlation between test results and the secant formula. 280 ref.

24B-47. (Book) **Theory of Modern Steel Structures. Vol. 1. Statically Determinate Structures. Rev. Ed.** Linton E. Grinter. 341 pages. 1949. Macmillan Co., 60 Fifth Ave., New York 11, N. Y.

Textbook for undergraduate courses considers basic problems of stress analysis by relating them to specific types of structures. Includes analysis of trusses which is divorced from the structure itself. Some design information concerning loadings and planning of the structure is integrated into each chapter in order to relate the subject of analysis to structural engineering. Footnote references.

24B-48. Perforated Cover Plates Improve Strength of Structural Steel Columns. *Steel,* v. 125, Nov. 28, 1949, p. 90, 92.

Results of tests at National Bureau of Standards in cooperation with American Institute of Steel Construction.

24B-49. Arc-Welded Beam and Column Framing. (Continued.) *Welding Journal,* v. 28, Nov. 1949, p. 1087-1088.

Design details.

24B-50. Effect of Buckles on Strength in Welded Ships. P. H. Take. *Welding Journal,* v. 28, Dec. 1949, p. 569s-574s.

A cooling-water ring-shaped spray encircling the burner tip was provided to produce severe buckling. It was found that, under certain conditions of restraint, buckles in plate section reduce the strength of plate sections and may act as notches. Under other conditions, where equalization of stress under load is possible, they may be harmless.

24B-51. (Book) **Elementary Structural Problems in Steel and Timber. Ed. 3.** C. R. Young and C. F. Morrison. 312 pages. 1949. John Wiley and Sons, 440 4th Ave., New York 16, N. Y. $4.50.

Presents a number of worked examples as a guide to students and junior structural designers in the application of structural theory to practical design problems. The section on steel construction has not been changed much from that in the second edition. It covers tension and compression members and their details; beams, box girders, and plate girders; steel trusses, cranes, and crane supports; moving loads on beams, trusses, and girders; and design of a 50-ft. span highway bridge.

24C—Nonferrous

24C-1. Die Casting Die Design. Part III. The Disposition of the Die Cavity. H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 14, Mar. 1949, p. 49-50, 52-54, 94.

Design principles clarified by diagrams.

24C-2. Saving on Shaving. *Die Castings,* v. 7, Mar. 1949, p. 34-35, 38.

Cost cutting is one of three reasons why several parts of the Remington electric shaver are being die cast in zinc. Other reasons are improved styling and superior functional design.

24C-3. Railroad Journal Bearings. E. S. Pearce. *American Society for Metals,* "Sleeve Bearing Materials," 1949, p. 241-248.

Major emphasis is on journal-bearing design. Materials also briefly discussed.

24C-4. Die Casting Die Design. Part III. (Continued.) H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 15, Apr. 1949, p. 58, 60, 74, 76.

Loose die components, number of cavities, shut off area, thermal balance, venting, and dimensional tolerances. (To be continued.)

24C-5. Wooden Die Model for Complex Part. *Die Castings,* v. 7, Apr. 1949, p. 24-26, 43.

Six-part die for the main frame of the Seeburg Select-O-Matic record player in which 37 holes are cored. Frame construction and die layout problem.

24C-6. Gear Assembly by Die Casting. *Die Castings,* v. 7, Apr. 1949, p. 28-30, 44.

Gear design of the Fold-A-Matic ironer. Designers have used zinc die castings to obtain accurately toothed gears where the loading permits, and have used inserts of other metals to good effect.

24C-7. Product Design With Die Castings: A Steak Machine. *Die Castings,* v. 7, June 1949, p. 34-36, 63.

Design and finish of machine for making steaks and other cuts of meat tender. Use of die castings.

24C-8. Made to Measure. *Die Castings,* v. 7, June 1949, p. 20-22, 59.

Zn-alloy, die-cast frame and parts of positive-displacement-type meter.

24C-9. Improved High-Speed Roller Bearings. Donald F. Wilcock and Frederick C. Jones. *Lubrication Engineering,* v. 5, June 1949, p. 129-133.

Examination of bearings removed from turbine engines revealed that the principal source of difficulty was in the brass roller separator or retainer. Laboratory test stand developed for study of full-size bearings under operating conditions. Results of test program. Effect of lubricant composition; effect of oxide coating of steel parts on transfer of brass to these parts; effects of other metals and electroplates on separator operation and life (silver plating found best); and effects of design modifications.

24C-10. Die Casting Die Design. Part IV. H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 15, July 1949, p. 56, 58, 60-61.

Design of sprues, runners, feeds, gates, overflows, and vents. Terms are defined. (To be continued.)

24C-11. No Slip-Ups. *Die Castings,* v. 7, July 1949, p. 19-20, 69-71.

Design and casting of parts for an electrode unit used to weld a criss-cross pattern on steel floors to prevent slipping.

24C-12. Economical Die Castings. James L. Erickson. *Product Engineering,* v. 20, Aug. 1949, p. 104-108.

How to design die-cast parts that can be produced by a short casting cycle and with simplified tooling.

24C-13. Die Casting Die Design. Part IV. Sprue, Runners, Feeds, Gate, Overflows and Vents. H. K. Barton and James L. Erickson. *Tool & Die Journal,* v. 15, Aug. 1949, p. 45-48.

(To be continued.)

24D—Light Metals

24D-1. Minimum Ribbing for Maximum Strength. *Die Castings,* v. 7, Feb. 1949, p. 34-35, 38-40.

How designers of the McCulloch chain saw have reduced stress concentrations by reducing the amount of ribbing. Magnesium die castings are used for major parts.

24D-2. Magnesium Castings Designed for Aircraft Engines. M. H. Young and A. G. Slachta. *American Foundryman,* v. 15, Mar. 1949, p. 41-45.

Stress-analysis and static and dynamic test methods used to discover inadequacies in design. Points to be guarded against by the engine designer and by the foundryman.

24D-3. Data on the Compressive Strength of 75S-T6 Aluminum-Alloy Flat Panels With Longitudinal Extruded Z-Section Stiffeners. William A. Hickman and Norris F. Dow. *National Advisory Committee for Aeronautics,* Technical Note No. 1829, Mar. 1949, 21 pages.

Concerned with panels in which the ratio of thickness of stiffener material to skin material varies from 0.4 to 1.0 and ratio of stiffener spacing to skin thickness from 15 to 40.

24D-4. Just Skating Along. *Die Castings,* v. 7, Apr. 1949, p. 22-23, 42.

Improvements made by Globe-Union in the weight, strength, appearance and simplified production of rink roller skates. Shoe plates were redesigned to substitute a single Al die casting for several stamped and cast parts.

24D-5. Design Light Metal Castings: Responsibilities of Metal Producers, Foundries, and Designers. George H. Found. *American Foundryman,* v. 15, Apr. 1949, p. 91-95.

With special attention to Mg casting alloys. Mechanical properties as affected by different factors. 12 ref.

24D-6. Aluminium Alloys in Building; General Design Considerations for Roof Structures. W. C. Devereux. *Metal Industry,* v. 74, Apr. 15, 1949, p. 283-285; Apr. 22, 1949, p. 311-313.

Design, erection, and testing procedures.

24D-7. Column Curves for Magnesium-Alloy Sheet. Evan H. Schuette. *Journal of the Aeronautical Sciences,* v. 16, May 1949, p. 301-305, 310.

Results for flat-end tests of 129 columns cut from flat FS-1h, FS-1a, and Ma magnesium-alloy sheet 0.250 in. thick and for clamped-end tests of 26 columns cut from flat FS-1h sheet 0.064 in. thick. The best empirical fits to the data were obtained with a parabolic formula.

24D-8. A Well-Integrated Product Design. *Die Castings,* v. 7, June 1949, p. 27-28, 65.

Paint spray-gun compressor, which incorporates four Al die-cast housing parts.

24D-9. Compression Tests of Curved Panels With Circular Hole Reinforced With Circular Doubler Plates. Wilhelmina D. Kroll and A. E. McPherson. *Journal of the Aeronautical Sciences,* v. 16, June 1949, p. 354-364.

Fourteen specimens of 24S-T Al-alloy sheet were tested to determine the effect of sheet curvature on strain distribution around circular

holes. Specimens with and without reinforcement of the hole were included. Radius of curvature ranged from 10 in. to infinity.

24D-10. Compressive Buckling of Flat Rectangular Metalite Type Sandwich Plates With Simply Supported Loaded Edges and Clamped Unloaded Edges. Paul Seide. *National Advisory Committee for Aeronautics,* Technical Note 1886, May 1949, 19 pages.

Theoretical solution. Comparison of computed and experimental buckling stresses of sandwich plates with Al-alloy faces and balsa-wood and cellular-cellulose-acetate cores indicates reasonable agreement between theoretical and experimental results.

24D-11. Magnesium Design Principles. Gilbert C. Close. *Light Metal Age,* v. 7, June 1949, p. 8-9, 22-23.

Accurate stress analysis, notch sensitivity, die casting, extrusion, welding, and corrosion resistance.

24D-12. Water Valve Redesigned for Easier Assembly. *Die Castings,* v. 7, July 1949, p. 22-23, 67.

Design and fabrication from aluminum die casting.

24D-13. Light-Alloy Pistons. (Concluded.) *Light Metals,* v. 12, July 1949, p. 393-395.

Summarizes information contained in "Nonferrous Metallurgy" (FIAT Review of German Science), Vol. I, p. 141T, M. Hansen, editor. (Previously abstracted as items 25C-44 and 25 C-45, 1949.) 29 ref.

24D-14. Formule et abaque pour la détermination des intensités admissibles dans les barres, tubes et profilés en Aluminium et alliages d'Aluminium. (Formula and Graphs for Determination of Allowable Stresses in Aluminum and Aluminum Alloy Bars, Tubes, and Shapes.) Pierre Chapoulie. *Revue de l'Aluminium,* v. 26, June 1949, p. 206-208.

Modified Melson and Booth derivation of formula and chart applicable to a large range of dimensions and to a wide variety of Al alloys.

24D-15. Big Die Casting Cuts Cost of Automobile Door. *Product Engineering,* v. 20, Sept. 1949, p. 111.

One-piece aluminum die casting for Kaiser-Frazer car doors reduces assembly costs and car weight.

24D-16. How To Design Aluminum Bridges. D. B. Steinman. *Engineering News-Record,* v. 143, Sept. 1, 1949, p. 198-202.

24D-17. Studio della forma più adatta per una struttura fusa in lega di magnesio in sostituzione di un' altra corrispondente in acciaio stampato e saldato. (Investigation of Optimum Design for Mg-Alloy Structures as Substitutes for Corresponding Ones of Formed and Welded Sheet Steel.) Roberto Guastalla. *La Metallurgia Italiana,* v. 41, May-June 1949, p. 135-143.

Details of work done in development of a satisfactory design of a cast Mg alloy wheel replacing a similar wheel formed from sheet steel.

24D-18. Superposition in Complex Straining. K. H. Swainger. *Proceedings of the Society for Experimental Stress Analysis,* v. 7, no. 1, 1949, p. 117-131.

The incremental theory applied to a duralumin plate round an expanded plug. 23 ref.

24D-19. Magnesium Alloys Simplify Jet Wing. *Product Engineering,* v. 20, Nov. 1949, p. 101.

Redesign of F-80 jet-plane wing from Al to Mg alloys. Number of pieces was reduced from 1640 to 508 and fastenings from 42,700 to 16,000. The Mg wing requires less time and labor to produce. Additional economies are realized from reduced tooling, fewer drawings, and simplified inventories.

24D-20. Stresses in and General Instability of Monocoque Cylinders With Cutouts. VII. Experimental Investigation of Cylinders Having Either Long Bottom Cutouts or Series of Side Cutouts. N. J. Joff, Bruno A. Boley, and Joseph J. Mele. *National Advisory Committee for Aeronautics,* Technical Note 1962, Oct. 1949, 57 pages.

Eight 24S-T Alclad cylinders were tested in pure bending. Dimensions and cutouts are given. They were reinforced with stringers and rings of various cross-sectional areas and spacings. All but one cylinder failed in general instability. That one failed in tension.

24D-21. Plastic Buckling of Extruded Composite Sections in Compression. Elbridge Z. Stowell and Richard A. Pride. *National Advisory Committee for Aeronautics,* Technical Note 1971, Oct. 1949, 15 pages.

Theory originally developed for individual plates has been extended to apply to combinations of plates such as H and Z-sections, and was applied specifically to extruded H-sections of 75S-T6 Al alloy. Calculated buckling stresses agreed satisfactorily with experimental results.

24D-22. Data on the Compressive Strength of 75S-T6 Aluminum-Alloy Flat Panels Having Small, Thin, Widely Spaced, Longitudinal Extruded Z-

Section Stiffeners. William A. Hickman and Norris F. Dow. *National Advisory Committee for Aeronautics,* Technical Note 1978, Nov. 1949, 23 pages.

Test specimens and procedure. Concerned particularly with panels in which the ratio of thickness of stiffener material to skin material is small and the ratio of stiffener spacing to skin thickness is large. 14 ref.

24D-23. Curved Plates in Compression. K. B. Jackson and A. H. Hall. *National Research Council of Canada,* Aeronautical Report No. 1, 1947, 98 pages.

Specimens and techniques used in two series of tests to determine load-deformation relations for curved Al-alloy plates with clamped edges under compression parallel to the axis of curvature. Results are analyzed and empirical equations derived for critical buckling stress, reduced buckling stress after loads exceeding the initial buckling stress, and post-buckling behavior or effective width. 10 ref.

24D-24. Aluminum Extrusions; Design Factors and Tolerances. H. V. Menking. *Machine Design,* v. 21, Nov. 1949, p. 127-132.

Cost savings made possible because of redesign from other forms to extruded sections.

24D-25. Les boites convolute et Z résultat de l'alliance du carton et de l'Aluminium. (Convolute and "Z" Type Boxes Made of Cardboard and Aluminum.) Claude Patin. *Revue de l'Aluminium,* v. 26, July-Aug. 1949, p. 259-261.

New types of containers composed of cardboard tubular bodies with aluminum lining, also metallic bottoms and lids. Several systems for attaching the lid: crimped, friction-type, slip-on, convolute, or Z-section.

24D-26. Chromium Plated Cylinders Increase Capacity of Lightweight Engines. A. W. Mall. *Iron Age,* v. 164, Dec. 1, 1949, p. 86-90.

How a portable engine was redesigned to take advantage of porous chromium plating of aluminum cylinder walls. Size, weight, and cost were reduced about 30% and rating of the unit increased 32%. Factors influencing the new design and various steps in processing the cylinders.

24D-27. Stability of Alclad Plates. Kenneth P. Buchert. *National Advisory Committee for Aeronautics,* Technical Note 1986, Dec. 1949, 33 pages.

On the basis of plasticity theory, a theoretical solution for buckling was developed. The differential equation of equilibrium and the energy expression are derived. Results are presented for the buckling of long simply supported plates under longitudinal compression and under shear, and for a plate-column. Theoretical and experimental results are compared.

24D-28. Étude d'un outillage métallique; Une coquille pour filtre à air en alliage d'Aluminium. (Study of Metallic Equipment; an Aluminum-Alloy Air-Filter Housing.) Jean Duport. *Fonderie,* Sept. 1949, p. 1740-1743.

Design details of equipment.

24D-29. Design of Light Metal Castings. Responsibilities of Metal Producers, Foundries, and Designers. George H. Found. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 409-413; discussion, p. 413-414.

Previously abstracted from *American Foundryman,* item 24D-5, 1949.

24D-30. Magnesium Castings Designed for Aircraft Engines. M. H. Young and A. G. Slachta. *Transactions of the American Foundrymen's Society,* v. 57, 1949, p. 378-382; discussion, p. 382-383.

Previously abstracted from *American Foundryman,* item 24D-2, 1949.

SECTION XXV

MISCELLANEOUS

A—General

25A-1. Atom Swapping: Your New Way to Purify Products, Pinch Costs. *Modern Industry,* v. 16, Dec. 15, 1948, p. 44-49.

Varied uses of ion-exchange in metallurgical and nonmetallurgical applications. A simplified explanation of how the process works and discussion of choice of equipment.

25A-2. New Isotopes for Industry. *Modern Industry,* v. 16, Dec. 15, 1948, p. 121-122, 124.

More than 100 stable isotopes are now available. Applications.

25A-3. Houdaille-Hershey's Central Research Laboratory. Walter Pinner. *Automotive Industries,* v. 99, Dec. 15, 1948, p. 41, 78.

New laboratory in Detroit and some of the problems being worked on.

25A-4. Mellon Institute. E. R. Weidlein, Jr. *Research,* v. 1, Dec. 1948, p. 705-708.

Organization and recent research accomplishments.

25A-5. Radioisotopes for Industry. A. P. Schreiber. *Electronics,* v. 22, Jan. 1949, p. 90-95.

Examples of successful tagged-atom applications and suggestions for adapting the techniques to other measuring, controlling, and tracing applications. Despite widespread speculation on possible industrial uses, only 90 of the approximately 3,100 shipments from Oak Ridge to date have been for industrial research and only 20 for metallurgical research.

25A-6. Business Prospects Under the Truman New Deal. B. K. Price. *Steel,* v. 124, Jan. 3, 1949, p. 121-125.

A forecast for 1949, with emphasis on metalworking aspects.

25A-7. West Seeks Industrial Self Sufficiency. Bert D. Lynn. *Steel,* v. 124, Jan. 3, 1949, p. 148-149.

New developments in western industry, especially in metal production and fabrication.

25A-8. Western Europe's War Wounds Begin to Heal. *Steel,* v. 124, Jan. 3, 1949, p. 150-153.

Information on metal-industry outputs for 1948, and future prospects for each country.

25A-9. American Billions Bolster Europe's Economy. L. E. Browne. *Steel,* v. 124, Jan. 3, 1949, p. 154-155.

Progress of Europe resulting from ECA, and impact on U. S. economy, particularly raw materials and fabricated products.

25A-10. Industry Behind the Iron Curtain. W. J. Campbell. *Steel,* v. 124, Jan. 3, 1949, p. 156-157.

Available general and specific information. Russia's metalworking industries have climbed back to prewar production levels, but goals of fourth 5-yr. plan are difficult.

25A-11. 1949 Annual Forum on Technical Progress in Metalworking. *Steel,* v. 124, Jan. 3, 1949, p. 185-204, 206, 208, 210-211, 214-216, 219-220, 222-224, 226, 229, 232-234, 239-240, 242, 244-245, 247, 250, 252, 254, 257-258, 260, 263-264, 266, 269, 272, 277-278, 281-282, 284, 286.

Brief summaries by experts in the respective fields. A number of articles are found under each of the following headings: Metallurgy; Casting; Forging; Forming; Joining, Welding; Inspection, Testing; Equipment; Heat Treating; Surface Treatment; Lubrication; Materials Handling; Metal Production; Machining.

25A-12. Radioactive Tracers in Metallurgical Research. M. G. Fontana. *Engineering Experiment Station News* (Ohio State University), v. 20, Dec. 1948, p. 39-41.

Present and potential applications.

25A-13. The Cavendish Laboratory. Lawrence Bragg. *Journal of the Institute of Metals,* v. 75, Nov. 1948, p. 107-114.

The work of this laboratory is divided among separate groups who study nuclear physics, radio, low-temperature physics, crystallography, metal physics, and mathematical physics. Research being done by the different groups.

25A-14. List of Vested Patents Available From Office of Alien Property U. S. Department of Justice. *Office of Technical Services* (Washington), 85 pages.

Abstracts of 358 patents, predominantly German, seized from enemy nationals by the Office of Alien Property and newly released to the American public. The abstracts are classified under 18 broad headings and arranged numerically by patent number under each classification.

25A-15. Metallurgy. E. S. Kopecki. *Iron Age,* v. 163, Jan. 6, 1949, p. 216-225.

More practical approaches to oxygen use, hot-topping innovations to improve yield, cold extrusion of steel, continuous casting, high-temperature ceramics, and ceramals are a few of the 1948 developments described. Developments in titanium and radioisotopes.

25A-16. Research. T. S. Blair. *Iron Age,* v. 163, Jan. 6, 1949, p. 240-247.

Skyrocketing costs of industrial research, combined with urgent need for process and product development programs, are confronting industry, particularly small plant management, with a serious problem. Outlines a yardstick for determining the size of appropriations for research and suggests how a small plant may economically undertake such programs. Includes several case histories of the "trouble-shooting" type of research.

25A-17. Uber das Haften von monomolekularen Filmen aliphatischer Substanzen an polierten Metalloberflächen. (The Adherance of Monomolecular Films of Aliphatic Substances to Polished Metal Surfaces.) Hans Joachim Trurnit. *Angewandte Chemie,* sec. A, v. 59, Sept. 1947, p. 273-276.

Procedure and results of experiments made in an attempt to develop an "adhesiveness index."

25A-18 (Book). **Minerals Yearbook, 1946.** 1638 pages. 1948. Bureau of Mines, Washington, D. C.

Latest annual issue covers the first full postwar year. It has been made considerably easier to use through one important change in format: the individual chapters on specific minerals are arranged alphabetically. In addition, easier-to-read typeface has been employed for principal headings, side headings, and table captions. The foreign mineral review has been retained. In the present volume, this section deals with middle and South America. Of particular interest is a chapter devoted to uranium and thorium. (From review in *Petroleum Processing.*)

25A-19 (Book). **A.S.M.E. Mechanical Catalog and Directory.** 738 pages. 1949. American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.

Covers products of 4600 manufacturers and contains 48,500 listings. As in previous editions, the material is arranged alphabetically, according to manufacturer's names. Eleven main industrial groups are included. Directory section of 300 pages lists products covered in the catalogue under 6500 classifications, together with names and addresses of manufacturers. A third section consists of an alphabetical list of trade names.

25A-20 (Book). **Directory of Engineering Data Sources.** 65 pages. 1948. Southeastern Research Institute, Inc., 5009 Peachtree Rd., Atlanta, Ga. $2.50.

A compact reference bulletin, giving more than 500 sources of published engineering data. These include technical universities and colleges, scientific and trade societies or associations, commercial publishers of books and periodicals, and Federal agencies engaged in scientific work.

25A-21. Electrical and Allied Developments During 1948. Guy Bartlett. *General Electric Review,* v. 52, Jan. 1949, p. 11-52.

Reviews General Electric developments under the headings: research, testing and measuring, power, industry, tranportation, electromedical, electronics, lighting, air conditioning, appliances, construction materials, and chemical and metallurgical.

25A-22. American Machinist 36th Annual Review of Metalworking Equipment, Parts and Materials. *American Machinist,* v. 93, Jan. 29, 1949, p. 125-260.

A classified review of 1400 new products introduced during the past year.

25A-23. Coordination of Metallurgical Work at General Electric. William E. Ruder. *Metal Progress,* v. 55, Jan. 1949, p. 43-46.

Organization and coordination of metallurgical research and production. The Schenectady research lab-

oratory, which is engaged in fundamental studies, is supplemented by at least 24 works laboratories throughout the U. S., all of which have some interest in metals.

25A-24. A Proposal for Research in Metallurgy. Michael G. Corson. *Metal Progress,* v. 55, Jan. 1949, p. 55-58.

Recommends that the government support a $200-million program in fundamental metallurgical research. Program would begin with preparation of large amounts of about 70 highly purified metals in three or more specific states. Other fields would be precise determinations of compressibility, specific gravity, thermal expansion, electrical and thermal conductivity, magnetic susceptibility, photoelectric effect, heat content, electrochemical and contact potential, and mono and bidirectional stress plus plasticity.

25A-25. Modern Petroleum Lubricants; A New Chemical Market. C. F. Prutton and F. F. Musgrave. *Chemical Engineering Progress* (Engineering Section), v. 45, Jan. 1949, p. 17-24.

Fundamental principles of lubricant action, bearing corrosion and inhibition, and the chemistry and mechanism of action of additives.

25A-26. Outlook in 1949 Unsettled for Materials Supplies and Prices. N. B. Bagger. *Materials & Methods,* v. 29, Jan. 1949, p. 49-53.

The following metals are considered individually: steel, pig iron, copper, lead, zinc, tin, magnesium, aluminum, and nickel.

25A-27. Materials at Work. *Materials & Methods,* v. 29, Jan. 1949, p. 74-76.

Powder cutting for scrapping of large cast-iron wheels; aluminum bronze switch bumper; stainless steel washfountain; brazing wrought-iron pipe joints; tools for spinning steel tubing.

25A-28. Review of Materials Engineering Developments in 1948. *Materials & Methods,* v. 29, Jan. 1949, p. 77-88.

Treated under the headings: trends in materials and their processing; iron and steel; nonferrous metals; nonmetallic materials; fabricated parts and forms; welding and joining; heat treating; finishing and coating; and shaping and forming.

25A-29. The Incremental Friction Coefficient—A Non-Hydrodynamic Component of Boundary Lubrication. J. T. Burwell and C. D. Strang. *Journal of Applied Physics,* v. 20, Jan. 1949, p. 79-89.

In investigations of lubricated sliding friction between two crossed cylinders it is found that for hard, smooth surfaces, friction force is a straight-line function of applied load. The slope of this line defines a friction coefficient, designated as the incremental friction, which is thought to have certain advantages in the study of nonfluid lubricated friction. 21 ref.

25A-30. Scientific Research in Australia. *Engineering,* v. 166, Dec. 17, 1948, p. 592-593; Dec. 24, 1948, p. 617-618; Dec. 31, 1948, p. 640-641. Based on 21st Annual Report of the Council for Scientific and Industrial Research, L. F. Johnston Commonwealth Government Printer, Canberra, Australia. 6s.

Summary of research activities in diverse fields for the year ending June 30, 1947.

25A-31. Temperature Dependence of Friction in the Case of Steel as Compared With Metals Having Low Melting Points. (In Russian.) A. D. Isinskii. *Zhurnal Technicheskoi Fiziki* (Journal of Technical Physics), v. 18, Sept. 1948, p. 1189-1193.

The above was investigated for steel vs. paraffin or Wood's alloy. In the case of a great difference in the melting points of the two materials involved, the coefficient of friction decreases considerably with increased temperature.

25A-32. Naval Construction Research Establishment. D. E. J. Offord. *Welder,* new ser., v. 17, Oct.-Dec. 1948, p. 76-78.

Facilities of British laboratory.

25A-33. Underground in a "Hot Lab". *Automotive Industries,* v. 100, Feb. 1, 1949, p. 25-28.

Picture story shows equipment and procedures being used by Ford Motor Co. in its research program on practical applications of atomic science to production problems. Possible uses of radioisotopes, in material processing, radiography, and instrumentation.

25A-34. Electrical Developments in Metal Working for 1948. *Steel Processing,* v. 35, Jan. 1949, p. 24-26.

Equipment for welding, rolling, heating, machining, pickling, and cleaning.

25A-35. Metals in Review. *Engineering and Mining Journal,* v. 150, Feb. 1949, p. 70-95.

Annual survey presents statistics and discusses economic trends in the following separate articles: "Gold," M. A. Kriz; "Silver," Dickson H. Leavens; "Copper," H. H. Wanders; "Lead," Robert Lindley

Ziegfeld; "Zinc," Charles R. Ince; "Tin," Erwin Vogelsand; "Light Metals," Richard J. Lund; "Minor Metals," Charles White Merrill; "Beryllium," Samuel A. Gustavson; "Arsenic," Samuel A. Gustavson; "Bismuth," Samuel A. Gustavson; "Mercury," Helena M. Meyer; "Antimony," Samuel A. Gustavson; "Cobalt," Hubert W. Davis; "Platinum-Group Metals," Hubert W. Davis; "Cadmium," Richard H. Mote; "Titanium," Helena M. Meyer; "Ferro-Alloy Metals," Charles White Merrill; "Manganese," Norwood B. Melcher; "Chromite," Norwood B. Melcher; "Nickel," Hubert W. Davis; "Molybdenum," Hubert W. Davis; "Tungsten," Hubert W. Davis; and "Non-Metallics," D. G. Runner. Tables and charts show variations in basic metal prices since 1897.

25A-36. Bearing Wear Caused by Electric Current. Donald F. Wilcock. *Electrical Manufacturing,* v. 43, Feb. 1949, p. 108-111.

Laboratory tests show that wear due to passage of current occurs only when the moving parts are separated by an oil film of critical thickness. Wear rate is a function of current rather than voltage, and is independent of bearing material.

25A-37. (Book). **Engineering Metals and Their Alloys.** C. H. Samans. 913 pages. MacMillan Co., 60 Fifth Ave., New York 11, N. Y. $7.50.

Gives a general background of metallurgy and provides a classification of the engineering metals from an application rather than an alloy viewpoint. Production of metals, the theory of alloys, principles of heat treatment, shaping and forming of metallic materials, corrosion, alloys resistant to wear and abrasion, alloys of high strength and toughness, tool materials, bearing alloys, and other subjects.

25A-38. Recent Milestones in Metals and Minerals. John D. Sullivan. *ASTM Bulletin,* Jan. 1949, p. 41-46.

Developments in winning raw materials from nature and making available various metal and mineral products to satisfy human wants. Some of the new materials now available, and probable trends in the immediate future.

25A-39. Canada's Mineral Production. Record Value for 1948. H. McLeod. *Canadian Mining Journal,* v. 70, Feb. 1949, p. 62-72.

25A-40. Lubrication of Metal Surfaces by Silicone Films. J. N. Gregory and Marjorie J. Newing. *Australian Journal of Scientific Research,* ser. A, v. 1, Mar. 1948, p. 85-97.

Molecular layers of the mono and diethyl and mono and di-isoamyl silicones on various metal surfaces were tested for their boundary lubricating properties. These materials have unusual thermal stability and resistance to wear.

25A-41. Collisions Through Liquid Layers. D. Tabor. *Engineering,* v. 167, Feb. 18, 1949, p. 145-147.

The nature of contact between colliding metal surfaces is of general interest in lubrication problems. When impact occurs between relatively long bodies, the process is largely due to generation and reflection of a compression wave in the colliding bodies. For small bodies, however, the process is determined mainly by deformations occurring at points of contact and the effect of the elastic compression wave can be ignored.

25A-42. Air Stored in Building Framework. Elton Sterrett. *Welding Engineer,* v. 34, Mar. 1949, p. 40-41, 45.

Unique compressed-air storage system. The hollow, welded, tubular framework of a Quonset-type structure provides 470 cu. ft. of capacity.

25A-43. Getting the Most Out of Friction-Type Bearings. H. L. Smith. *Iron Age,* v. 163, Mar. 3, 1949, p. 96-99.

Oil-groove location, surface finish, babbitt-layer thickness, clearance, and other variables affecting the life and service of both nonprecision and precision bearings. Effect of inertia load on precision-bearing design and testing; load-carrying abilities.

25A-44. Ferroalloy Metals. R. G. Knickerbocker. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 95-97.

1948 commercial and technical developments.

25A-45. Mineral Economics in 1948. Paul M. Tyler. *Mining Congress Journal,* v. 35, Feb. 1949, p. 101-103, 109.

25A-46. Mineral Position of ECA Nations. No. 12. Sweden. Geoffrey Smith. **No. 13. Norway.** Arne Solem. **No. 14. Finland.** Herman Stigzelius. *Engineering and Mining Journal,* v. 150, Mar. 1949, p. 78-83.

Present status of mineral reserves and the mining and concentration industry. (Concludes series.)

25A-47. Static Friction of Two Rough Surfaces. (In Russian.) I. V. Kragels'kii. *Izvestiya Akademii Nauk SSSR,*

Otdelenie Tekhnicheskikh Nauk (Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences), Oct. 1948, p. 1621-1625.

A mathematical analysis. Formulas for determination of coefficient of friction. Factors involved in this phenomenon.

25A-48. (Book.) **Standard Metal Directory; 1948-49. Ed. 11.** 999 pages. Atlas Publishing Co., 425 W. 25th St., New York 1, N. Y. $15.00.

Five sections, embracing iron and steel plants; ferrous and nonferrous metals, and a new section called: "Metal Products Index" which lists geograhpically distributors of steel and metal products. Contains more than 10,000 detailed reports on steel mills, foundries, smelters, rolling mills and nonferrous metal plants, located in the U. S. and Canada. Also contains special lists of producers and distributors of pig iron, ores, ferroalloys; metal powder producers and sellers; smelters of primary and secondary nonferrous metals; storage battery manufacturers; galvanizing plants; railroad purchasing agents; aircraft manufacturers; dealers in used pipe and rails; scrap-iron and scrap-metal dealers; importers and exporters.

25A-49. (Book) **Quin's Metal Handbook and Statistics. Part I. Non-Ferrous Metals. Part II. Iron and Steel. Ed. 35.** F. B. Rice-Oxley, compiler. 388 and 164 pages, respectively. Metal Information Bureau, Ltd., Princes House, 39 Jermyn St., London, S.W.1, England. 10s. and 7s., 6d., respectively.

World-wide commercial and technical information.

25A-50. Pen and Ink Mark Gages. R. Kaden. *American Machinist,* v. 93, Mar. 24, 1949, p. 123-124.

How identification marks can be applied to metal tools by use of India ink, followed by Glyptol-Vinylite coating, and baking. Oils and cutting fluids encountered in machine shops do not affect the coating; nor is it subject to wear from handling.

25A-51. Allis-Chalmers Put Through Extensive Research Program in 1948. *Blast Furnace and Steel Plant,* v. 37, Mar. 1949, p. 345-346.

Projects and results obtained.

25A-52. Lowdown on New Uses for High Vacuum. *Modern Industry,* v. 17, Mar. 15, 1949, p. 46-49.

Miscellaneous industrial metallurgical and nonmetallurgical uses.

25A-53. The Frictional Behaviour of Engineering Materials. R. C. Parker. *Engineering,* v. 167, Mar. 4, 1949, p. 193-196; Mar. 11, 1949, p. 217-219.

The usually accepted law of proportionality of friction to "coefficient of friction" times load is subject to wide variations, partly as a result of effect of large loads on structure of the sliding surfaces. Experimental work on metallic and nonmetallic brake linings using full-scale and reduced-scale equipment. Scaled-down tests are shown to give unsatisfactory results. Concluding installment discusses the relative value of service and full-scale laboratory tests.

25A-54. Metallic Friction and Surface Damage at Light Loads. J. R. Whitehead. *Research,* v. 2, Mar. 1949, p. 145-147.

Electron micrographs show surface damage due to steel sliding on electropolished aluminum under loads of 0.3, 75, and 150 g. Aluminum oxide and Formvar replica techniques were used.

25A-55. Northwest Power. Ivan Bloch. *Western Metals,* v. 7, Apr. 1949, p. 32-38.

Production and power consumption by various primary and secondary metal industries.

25A-56. Molybdenum Disulphide as a Lubricant. *Alloy Metals Review,* v. 7, Mar. 1949, p. 2-8.

Molybdenum disulphide possesses a remarkable capacity for preventing galling and seizing at bearing pressures well over 45 tons per sq. in. and at either high or low velocities. Experimental work indicates that its lubricating properties are due to its unique structure. Each lamina of this compound is composed of a sheet of Mo atoms with a sheet of S atoms on each side. One of these adheres strongly to the metal surface because of the metal-sulfur bond. The others slip easily because of the weakness of the S-S bond.

25A-57. The Chemical News Parade: Chemists Aid Dental Research. *Chemical and Engineering News,* v. 27, Apr. 11, 1949, p. 1068-1069.

National Bureau of Standards work on dental materials (metallic and nonmetallic).

25A-58. Oscillatory Sliding Friction (The Frictionless Bearing). (Continued.) Stephen Thyssen-Bornemisza. *Microtecnic* (English Edition), v. 3, Jan.-Feb. 1949, p. 22-33. Translated from the German.

Results of investigation revealed a surprisingly great decrease of the coefficient of friction with increased oscillation speed of the shaft. In

most of the experiments a decrease to 3-7% of normal friction was observed, although one experiment resulted in a reduction of 0.3% of normal. Work was limited to friction of steel on steel.

25A-59. (Book.) **Your Career in the Metallurgical Profession.** John W. W. Sullivan. *American Society for Metals,* 7301 Euclid Ave., Cleveland 3, Ohio. 96 pages, $1.00.

Written for students, this booklet paints a bright picture of the opportunities of the metallurgical profession. The different types of work and problems awaiting solution are enumerated. Concludes with case histories of 13 up-and-coming metallurgists.

25A-60. (Book.) **Process and Physical Metallurgy.** James E. Garside. 499 pages. 1949. Charles Griffin & Co., Ltd., 42 Drury Lane, London, England.

Extraction methods and processes are only lightly touched upon. Methods of fabrication such as casting processes are dealt with more fully. Physical methods involving X-rays, electrical and magnetic measurements are not described. Chapters on temperature measurement, on metallography, on heat treatment and on surface hardening of steel on welding; also on specific alloy types and on metals for specific uses (type metals and bearing metals).

25A-61. (Book.) **Sources of Engineering Information.** Blanche H. Dalton. 109 pages. 1948. University of California Press, Los Angeles. $4.00.

Information on every type of engineering, including aeronautics, electronics, illumination, electrical engineering, mechanical engineering, metals and metallurgy, petroleum engineering, mining engineering, civil engineering, materials testing, ventilation, hydromechanics. Important source material.

25A-62. (Book.) **Klingelnberg Technisches Hilfsbuch.** (Klingelnberg's Technical Handbook.) Ed. 12. Ernst Preger and Rudolf Reindl, editors. 762 pages. Springer-Verlag, Jebensstrasse 1, Berlin-Charlottenburg 2, Germany. 15 D. M. paperbound; 18 D. M. clothbound.

New matter in this edition includes a table of involute functions, and a section on mechanics, with additional information on moments of inertia and centers of gravity. An excellent work of reference, with numerous tables and formulas. Properties of engineering materials, metals, and nonmetals, heat treatment of metals, essential machining processes, and machine-design data.

25A-63. (Book.) **Métallurgie: Alliages Métalliques.** (Metallurgy: Metallic Alloys.) C. Chaussin and G. Hilly. 178 pages. 1948. Dunod, 92 rue Bonaparte, Paris 6, France.

A theoretical treatise covering both ferrous and nonferrous alloys. Methods of preparing constitution diagrams for binary, ternary, and quaternary systems and their interpretation. Methods of examination and investigation of ferrous and nonferrous alloys. Mechanical properties and chemical compositions of the most widely used alloys. Includes heat treatment and aging, corrosion and its prevention, and chemical analysis.

25A-64. Thirty-Fourth Annual Report of the National Advisory Committee for Aeronautics, 1948. *U. S. Government Printing Office,* 1949, 58 pages.

Technical activities including aerodynamics, propulsion, airframe construction, and operating problems research; research sponsored in scientific and educational institutions; research coordination; and distribution of information. List of committee members and financial report.

25A-65. Pile Materials: Metals, Alloys and Compounds. A. R. Kaufmann. "The Science and Engineering of Nuclear Power." Vol. II. Addison-Wesley Press, Cambridge, Mass., 1949, p. 238-248.

A brief introduction followed by sections on the metallic state; properties of alloys; phase relationships; production and manufacturing problems; fabrication of metal; analytical problems; forging, extrusion, and rolling; anisotropy of materials; and welding.

25A-66. Le frottement élémentaire. L'usure. (Elementary Friction. Wear and Tear.) Andre Marcelin. *Revue de Métallurgie,* v. 46, Jan. 1949, p. 27-35; discussion, p. 35.

Tests for investigation of lubricated and elementary friction, friction caused by alternating motion, and evolution of friction and wear. Test method and installations used.

25A-67. A Proposal for Research in Metallurgy. G. M. Foley. *Metal Progress,* v. 55, Apr. 1949, p. 503-504.

Comments critically on article of above title by M. G. Corson (Jan. issue). Recommends a more conservative approach and less tendency to rely on government support. Includes Corson's reply. The latter insists that such research will have to be done by a government agency, since no commercial organization will do it.

25A-68. Foundry Statistics. *Foundry,* v. 77, May 1949, p. 165.

Index of equipment orders, data on production workers, and on shipments and production of castings.

25A-69. Thermoelectric Experiments With Extreme-Pressure Lubricants. Robert Schnurmann. *Journal of Applied Physics,* v. 20, Apr. 1949, p. 376-383.

Requirements of lubricants. Experimental procedure. An attempt was made to calibrate thermal electromotive forces in terms of temperature. 10 ref.

25A-70. Metal Markets Undergoing Price Corrective; Does Not Signify Business Headed for Bust. Joseph Zimmerman. *Metals,* v. 19, Apr. 1949, p. 9-11, 13.

Excerpts from address by editor-in-chief, *Daily Metal Reporter.*

25A-71. ECA Program Not Likely to Have Important Impact on Domestic Producers of Metals. Evan Just. *Metals,* v. 19, Apr. 1949, p. 12-13.

Opinions of director, Strategic Materials Div., Economic Cooperation Administration.

25A-72. NACA Lowers High-Speed Flight Hurdles. Robert McLarren. *Aviation Week,* v. 50, May 9, 1949, p. 21-22, 24-26, 29-30.

Aeronautical research progress of NACA during past year, on the basis of the annual report. 18 ref.

25A-73. Isotopes and Their Application in the Field of Industrial Materials. Paul C. Aebersold. *American Society for Testing Materials, Proceedings,* v. 48, 1948, p. 527-554. (Also as separate 28-page booklet at $1.00 per copy.)

Benefits derived from the application of researches in atomic science to other fields. Application of radioactive and stable isotopes; their properties, production, radioisotope measurement, facilities, and safety precautions. (1948 Edgar Marburg Lecture.) 77 ref.

25A-74. Das System Metall/Lösung als einfache Elektrode. I. Uber Zahl u. Art der Ionenubergänge am System Metall/Lösung (Metallelektrode). [The System Metal-Solution as a Simple Electrode. I. Number and Type of Ion Transfers in the Metal-Solution System (Metal Electrode).] K. Nagel. *Archiv fur Metallkunde,* v. 3, Jan. 1949, p. 33-38.

A theoretical discussion of the kinetics of ion transfer, especially with simple electrodes (electrochemical polarization). 10 ref.

25A-75. Hard Chromium-Plated Bearing Surfaces With Anti-Friction Qualities. K. Gebauer. *Engineers' Digest,* v. 10, Mar. 1949, p. 99-100. Translated and condensed from *Metalloberfläche,* v. 2, Aug. 1948, p. 161-165.

Production of small grooves or pockets by cutting or etching the base metal before plating resulted in improved frictional properties. Advantages of grooving the base metal rather than the plating, the principal one being that the plating thickness remains uniform and follows the contour of the irregularities.

25A-76. Research in the Non-Ferrous Field as Carried Out at the Research Laboratories of the General Electric Company, Limited. Ivor Jenkins. *Metal Treatment and Drop Forging,* v. 16, Spring 1949, p. 49-57.

25A-77. Role of the Mineral Industries in the National Economy. John D. Sullivan and Margaret L. Willigman. *Engineering Experiment Station News* (Ohio State University), v. 21, Apr. 1949, p. 17-25. A condensation.

Depletion of reserves and utilization of available materials. Consumption curves for common mineral reserves over a considerable period of years. Tonnage production of various industrial materials and per capita consumption of energy from various mineral fuels and water power.

25A-78. Parade of Nations. *Mining World,* v. 11, Apr. 15, 1949, p. 53-64, 66.

Foreign mineral production by country.

25A-79. Metals and Minerals Review. *Mining World,* v. 11, Apr. 15, 1949, p. 36-48.

Brief economic surveys as follows: "Lead", Henry L. Day; "Copper", James Douglas; "Silver", Roger O. Oscarson; "Manganese", "Aluminum", Floyd A. Lewis; "Gold", Joseph Stagg Lawrence; "The Atom"; "Antimony", Worthen Bradley; "Beryllium", Arthur I. Johnson; "Molybdenum", C. M. Loeb, Jr.; "Cobalt"; "Tungsten", Worthen Bradley; "Zinc", O. W. Bilharz; "Bismuth"; "Phosphates", Louis Ware; "Magnesium", L. H. Woodward; "Nickel", Robert C. Stanley; "Cadmium"; "Fluorspar", Hugh E. McCray; "Mercury", Gordon I. Gould; "Tin"; "Potash", J. W. Turrentine; "Iron"; "Titanium", Joseph H. Reid; and "Arsenic".

25A-80. 1948 Gold, Silver, Copper, Lead and Zinc Production in 12 Western States and Alaska. *Mining World,* v. 11, Apr. 15, 1949, p. 69.

25A-81. Parade of the States. *Mining*

World, v. 11, Apr. 15, 1949, p. 71, 73-76, 78-79, 81, 83, 85, 87, 89, 91, 93, 95, 97, 99-100.

Survey of U. S. mineral production by states.

25A-82. Possible Markets—Ores—Metals—Non-Metallics. *Mining World,* v. 11, Apr. 15, 1949, p. 105, 107-109.

Listed under materials.

25A-83. Directory of Active Metal Mining Operations. *Mining World,* v. 11, Apr. 15, 1949, p. 112-164.

List of American mining properties is presented alphabetically by states.

25A-84. Metallurgical Considerations in the Application of Nuclear Energy for the Propulsion of Aircraft. Walter J. Koshuba. *Metal Progress,* v. 55, May 1949, p. 635-640.

Most obvious need is to develop materials that will be serviceable above 2000° F., but the problem is complicated by the necessity for these materials to satisfy nuclear requirements for a given atomic plant. Furthermore, the power plant must be light enough and small enough to be contained in a practical aircraft. How some of the metallurgical considerations will depend on the choice of atomic power plant.

25A-85. Metals for the Future. Charles Will Wright. *Engineering and Mining Journal,* v. 150, May 1949, p. 94-97.

The outlook. World production of the major base metals, prospective imports from Europe, and the work of the strategic materials division of E.C.A. Production and consumption.

25A-86. How to Choose and Use Portable Tools. Part 1. The Economic Approach. H. P. Bailey. *American Machinist,* v. 93, May 19, 1949, p. 91-93.

Method for analyzing actual costs.

25A-87. (Book) **Repertorio Della Metallurgia, Meccanica, Elettrotecnica.** (Directory of Italian Manufacturers in the Mechanical, Electrotechnical, and Metallurgical Industries.) 600 pages. Published by Societa Editrice and distributed in U. S. by E. L. Vidale, 125 W. Twelfth St., New York 11, N. Y. $6.00.

Names and addresses of 9000 manufacturers in the metallurgical, mechanical, and electrotechnical industries of Italy, classified according to products and geographical location. Indexes to the 106 product classifications are provided in Italian, English, French, Spanish, and German.

25A-88. (Book) **Chemie der Metalen.** (The Chemistry of the Metals.) Hermann Römpp. 302 pages. Uitgeverij "De Techniek", Paleisstraat, 76, Antwerpen, The Netherlands.

A semi-technical treatise in the Dutch language on the chemical behavior and properties of the metals and their respective alloys.

25A-89. (Book) **Engineering Metallurgy.** W. E. Woodward. 176 pages. 1948. Constable and Company, Ltd., 10-12 Orange St., London, W.C.2, England.

An elementary treatment designed to give the engineer sufficient knowledge for intelligent selection of metallic materials and specification of fabrication procedures. Introductory chapters on "Metals" and "Alloy Systems". Ten chapters on ferrous metallurgy, welding, Cu and alloys, Al and Mg and alloys, Ni and alloys, bearing metals, die castings, mechanical testing, and pyrometry.

25A-90. (Book) **The Mineral Industry of the British Empire and Foreign Countries: Statistical Summary** (Production, Imports and Exports), 1938-1944. 379 pages. 1948. The Imperial Institute, London.

25A-91. Economic Mobilization and the Mineral Industry. John D. Morgan, Jr. *Mining Congress Journal,* v. 35, May 1949, p. 31-33, 43.

Incongruous regionalization plans which hampered production of essential materials in World War II. Suggests a plan with what is thought to be adequate decentralization.

25A-92. The Electrochemical and Electrometallurgical Industry of Norway. C. W. Eger. *Journal of the Iron and Steel Institute,* v. 162, May 1949, p. 13-15.

The principal electrochemical and electrometallurgical plants, and their products, in the various industrial areas of Norway.

25A-93. Scientific Research at Mellon Institute, 1948-49. *Chemical and Engineering News,* v. 27, May 30, 1949, p. 1591-1595.

Progress of chemical interest on 45 multiple and 33 individual fellowships, including work on several metallurgical problems.

25A-94. The New Materials Testing Department of Escher Wyss. W. Stauffer. *Escher Wyss News,* v. 19-20, 1946-47, p. 3-16.

Well-equipped mechanical and chemical testing laboratory of a Swiss firm.

25A-95. Nuclear Instrument Handbook. *Nucleonics,* v. 4, May 1949, p. 97-152.

Consists of "Survey of Nucleonics Instrumentation Industry", R. E. Lapp; five papers on measurement problems ("Nuclear Physics", Sanborn C. Brown; "Radiology", Howard L. Andrews; "Health Physics",

David Balber; "Radiochemistry", L. Yaffe; and "Industry"—a list of suggested uses of isotopes); two papers on properties of materials ("Photographic Recording Media", Herman Yagoda; and "Counter Fillings", Sanborn C. Brown); "Bibliography on Radiation Detection", H. H. Goldsmith; and buyers' guide.

25A-96. Mineral Depletion and Metal Supply. Evan Just. *Journal of Chemical Education,* v. 26, June 1949, p. 331-333.

25A-97. What Is Metallurgy? John Chipman. *Journal of Metals,* v. 1, sec. 3, June 1949 (*Metal Transactions,* v. 185), p. 349-354.

Metallurgical engineering, science, and education. Includes an outline of metallurgy.

25A-98. The Surface Roughness of Bearing Surfaces and Its Relation to Oil Film Thickness at Breakdown. A. Cameron. *Engineer,* v. 187, May 13, 1949, p. 540-541. A condensation.

Special test method and apparatus. Experimental results.

25A-99. Basic Research Projects Under ONR Contracts. Karl R. Sapngenberg and Walter E. Greene. *Electronics,* v. 22, June 1949, p. 66-69.

Extent to which Office of Naval Research is sponsoring fundamental research. Details of several current projects that promise early practical applications.

25A-100. The Production of Stable Isotopes and Their Uses in Research. W. C. Davis, L. O. Love, and L. O. Gilpatrick. *U. S. Atomic Energy Commission,* AECD-2436, Nov. 18, 1948, 6 pages.

Progress on a project using the equipment and techniques developed for the electromagnetic concentration of U^{235} for the separation of the isotopes of the entire periodic table of the elements. Isotopes of Fe and Hg are discussed.

25A-101. Radioéléments artificiels en métallurgie. (Artificial Radioactive Elements in Metallurgy.) Pierre Sue. *Revue de Métallurgie,* v. 46, Feb. 1949, p. 72-78.

Surveys uses of radioactive isotopes (artificially produced) as tracers in metallurgical research. 33 ref.

25A-102. Annual Report of the Defence Research Laboratories for the Year Ended 30th June, 1948. *Dept. of Supply and Development, Commonwealth of Australia,* 46 pages.

Progress reports on general chemistry, chemical defense, explosives and ammunition, metallurgy, engineering, metrology, and physics.

25A-103. (Book) **The Basing Point System.** Fritz Machlup. 275 pages. Blakiston Co., Philadelphia 5, Pa. $5.00.

Economic analysis reviews history of the development of the system and of court examinations of it. Arguments as to the monopolistic or discriminatory features of the system, and a theoretical evaluation of the cost of abolishing the system.

25A-104. (Book) **Metal Statistics, 1949.** Ed. 42. 800 pages. 1949. American Metal Market Co., 18 Cliff St., New York 7, N. Y.

25A-105. (Book) **Commodity Year Book, 1949.** 472 pages. 1949. Commodity Research Bureau, Inc., 82 Beaver St., New York 5, N. Y.

To assist business men in evaluating the implications of the effects of developments, both national and international, with respect to the various commodities and to their own businesses. Includes numerous special articles on topics such as hedging, farm price supports, as well as on individual commodities. Data for the first time on a number of lesser known but strategically important metals.

25A-106. (Book) **The Domestic Mining Industry of the United States in World War II; A Critical Study of the Economic Mobilization of the Mineral Base of National Power.** John Davis Morgan Jr. 500 pages. 1949. National Security Resources Board, Washington 25, D. C.

Various problems which arise: manpower, supply, equipment, government relationships, and others. 31 page bibliography.

25A-107. (Book) **Politica Metalurgica do Brasil.** (Metallurgical Policy of Brazil.) 102 pages. Oct. 1948. University of Sao Paulo, Polytechnical School, Sao Paulo, Brazil. (Bulletin No. 6.)

Symposium and discussion divided into four parts: the fuel problem; the ore-exportation problem; production of ferrous and nonferrous metals, including reducing agents and processes; and existing installations.

25A-108. The Drop Forge Industry Today: A Look Ahead. Part I. Robert E. W. Harrison. *Steel Processing,* v. 35, May 1949, p. 252-255.

Present situation, trends, and future prospects. (To be continued.)

25A-109. Reibung und Schmierung. (Friction and Lubrication.) H. Stäger. *Schweizer Archiv fur Angewandte Wissenschaft und Technik,* v. 15, Apr. 1949, p. 97-116.

Factors affecting the wear and wear resistance of moving parts. Theory and methods of reducing wear by means of cooling and friction-reducing lubricants. 13 ref.

25A-110. Where to Find Information on Mineral Raw Materials. M. M. Leighton. *Chemical Industries,* v. 64, June 1949, p. 930-931.

Listing of sources. Cites examples from the work of the Illinois State Geological Survey. 99 ref.

25A-111. Metals Lab at C.N.R. Handles Many Problems. *Canadian Metals and Metallurgical Industries,* v. 12, June 1949, p. 16-17, 37-38.

Equipment and problems worked on at laboratory of Canadian National Railways.

25A-112. Book-Length Biographies of Engineers, Metallurgists and Industrialists. Thomas James Higgins. *Illinois Institute of Technology,* 14 pages.

Results of a decade of searching and recording the above written in English. Books are listed according to subject heading.

25A-113. (Book) **Research in Industry.** 84 pages. 1948. His Majesty's Stationery Office, London, England.

Consists of the following articles, by separate authors, from *The Board of Trade Journal:* How Science Can Help Industry; Cotton; Glass; Wool; Rayon; Pottery; Iron and Steel; Electronics; Lace; Linen; Boots and Shoes; Paint; Furniture; The Electrical Industry and Consumer Goods; Plastics; Machine Tools and Small Tools; Light Engineering; Industrial Design; Radar.

25A-114. The Charles M. Schwab Memorial Lecture. Karl T. Compton. *American Iron and Steel Institute,* 1949 Yearbook, 18 pages. (Preprint.)

Metallurgical and international problems of significant interest to the military, which include discussions of heat resistant materials, work collaboration, surface tension, titanium, aerial warfare, and the North Atlantic Treaty.

25A-115. Government's Defense Stockpiling Program and Its Effects on Markets and Prices. E. H. Hawkins. *Metals,* v. 20, July 1949, p. 6-7, 9-10.

Organization, policies, and methods involved. Military procurement program. Stockpiling materials range from Sb to zircon, from castor oil to diamonds.

25A-116. Punch Card for the Field of Metal Finishing. T. A. Hood. *Metal Progress,* v. 56, July 1949, p. 75-78.

Designed at the Defense Research Laboratories of the Commonwealth of Australia's Department of Supply and Development, it is the first of a coordinated series of cards planned to cover each of several divisions of metallurgy.

25A-117. G.E.C. Research Laboratories Conversazione. *Engineer,* v. 188, July 1, 1949, p. 12-13.

Some of the facilities and activities of the laboratories of General Electric, Ltd., Wembley, England. These include production of sapphire rod, synchrotron vacuum chambers, photometry, diamond dies for wire drawing, and use of powder metallurgy in production of "G.E.C. Heavy Alloy" (about 90% W, plus N and Cu). Mechanical and physical properties of this alloy are given.

25A-118. The Measurement of Bearing Wear by Radioactive Methods. *Engineering,* v. 168, July 1, 1949, p. 9.

New British application of radioactivity in engineering research.

25A-119. Recent Advances in Hard Metal Processes. *Chemical Age,* v. 61, July 2, 1949, p. 24.

On basis of English patent applications.

25A-120. High-Voltage Research and Development in the British Cable-Making Industry. *Engineer,* v. 188, July 8, 1949, p. 51-52. Condensed from paper by T. R. Scott.

Miscellaneous metallurgical and nonmetallurgical research.

25A-121. Réactivité des corps solides; Applications techniques actuelles et perspectives d'avenir. (Reactivity of Solids; Existing Technical Applications and Future Prospects.) **J. Arvid** Hedvall. *Bulletin de la Société Chimique de France,* **Mar.-Apr. 1949, p.** D238-D250.

The present status of knowledge and practical application. Importance of results obtained by magnetic methods and by study of the reactivity of solids at their transformation temperatures. Various applications in ceramics, glass, cement, refractory materials, and powder metallurgy. 36 ref.

25A-122. Engineering Research in the Universities. W. L. Everitt. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 9-12, 98.

25A-123. Engineering Research at Research Institutes. Clyde Williams and Bert D. Thomas. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 13-16, 99-101.

History and current activities of the various U. S. research institutes. Trends and future prospects.

25A-124. Engineering Research in Industry. Games Slayter. *Engineering*

Experiment Station News (Ohio State University), v. 21, June 1949, p. 17-20.

Problems encountered.

25A-125. Horizons in Metallurgy. J. B. Austin. *Engineering Experiment Station News (Ohio State University),* v. 21, June 1949, p. 43-46, 114-117.

Recent developments and future prospects.

25A-126. Role of the Mineral Industries in the National Economy. John D. Sullivan and Margaret L. Willigman. *Engineering Experiment Station News* (Ohio State University), v. 21, June 1949, p. 61-64, 123-131.

Previously abstracted from condensed version in the April issue of *Engineering Experiment Station News,* item 25A-77, 1949.

25A-127. Role of the Mineral Industries in the National Economy. John D. Sullivan and Margaret L. Willigman. *Mines Magazine,* v. 39, July 1949, p. 17-22, 24.

Previously abstracted from *Engineering Experiment Station News,* item 25A-77, 1949

25A-128. 5974 Foundries in United States and Canada. *Foundry,* v. 77, Aug. 1949, p. 81.

A tabulation by states and type.

25A-129. Sur la détermination du nombre de molécules grasses adsorbées par un métal au cours de la lubrification. (Determination of the Number of Fatty-Acid Molecules Adsorbed by Metals During Lubrication.) Jean-Jacques Trillat and Jean Brigonnet. *Comptes Rendus,* v. 228, May 16, 1949, p. 1587-1588.

Results of investigation showed that the adsorption of oleic acid reaches a maximum of about 500 layers of molecules after continuous contact with a stream of the acid for about 4 hr.

25A-130. How To Identify Engineering Materials. Benjamin Melnitsky. *Steel,* v. 125, Aug. 29, 1949, p. 66-70, 72.

Clear and accurate marking of forgings, castings, and tubing in process. Production economies which can result.

25A-131. The French Nuclear Reactor. *Metal Progress,* v. 56, Aug. 1949, p. 202-203. Translated excerpts from articles by Frederick Joliot-Curie, Maurice Surdin, Bertrand Goldschmidt, and L. Kowarski, *Atomes,* Feb. 1949.

New 10-kw. reactor using bars of sintered uranium oxide immersed in heavy water.

25A-132. Britain's Base Metal Position. P. J. Sergeant. *Mining World,* v. 11, Sept. 1949, p. 39-40.

Analysis of Britain's current position indicates that the future of the Empire's mining industry may be tied to U. S. prices.

25A-133. U. S. Bureau of Mines Reorganizes. James Boyd. *Mining Engineering* (News Section), v. 1, Sept. 1949, p. 40-41.

It is believed that the new system will cut red tape in Bureau aid to industry, will enable it to provide more information for policy-making government agencies, and will be cheaper to operate.

25A-134. Planning of Engineering Research. W. E. Kingston. *Metal Progress,* v. 56, Sept. 1949, p. 341-343.

One method of planning basic and applied research that has made available improved returns from engineering effort, not only in terms of practical and theoretical results, but also from the standpoint of the satisfaction and happiness of engineering staff members.

25A-135. Metallurgy Program of the Office of Naval Research. I. R. Kramer. *Metal Progress,* v. 56, Sept. 1949, p. 351-355.

Fields of research are: plastic flow and fracture; transformation in solid metals; effects of alloying elements; corrosion; new heat resistant materials; and chemistry of steelmaking.

25A-136. The Metal Situation. Joseph Zimmerman. *Proceedings Fifth Annual Meeting, Metal Powder Association,* 1949, p. 108-115.

Economic trends.

25A-137. L'organisation de la recherche sidérurgique en France et à l'étranger. (Organization of Metallurgical Research in France and Abroad.) G. Delbart. *Revue de Métallurgie,* v. 46, Apr. 1949, p. 237-254.

A short comparative review of metallurgical research facilities in France, the U.S., the U.S.S.R., Great Britain, Germany, Belgium, Italy, Czechoslovakia, Canada, Luxemburg, Sweden, India, Australia, Japan, Spain, and Switzerland. Data presented cover the period up to 1947.

25A-138. Production in High Vacuum. *Fortune,* v. 40, Sept. 1949, p. 121-124, 127-128, 130, 132.

Commercial processes utilizing high vacuum. Methods and apparatus. Among the diverse applications are metallizing of plastics, vacuum distillation, electromagnetic separation of uranium, vacuum impregnation of porous castings.

25A-139. The Adsorption of Long Chain Polar Compounds From Solution on Metal Surfaces. E. B. Greenhill. *Transactions of the Faraday Society,* v. 45, July 1949, p. 625-631.

Adsorption isotherms of the above on metal powder were determined. Saturation of the surface, giving a unimolecular layer, occurs at very low concentrations with strongly adsorbed substances such as stearic acid, whereas alcohols and esters require much higher concentrations. The adsorption process appears to be the same for thoroughly cleaned and reduced powders as for oxide-coated powders. Compares results and the boundary-lubricating properties of acids, alcohols, and esters.

25A-140. The Lubrication of Metal Surfaces by Mono- and Multi-Molecular Layers. E. B. Greenhill. *Transactions of the Faraday Society,* v. 45, July 1949, p. 631-635.

The boundary-lubricating properties of stearic acid, ethyl stearate, octadecyl alcohol, and the stearates of copper and silver. Layers of these compounds were deposited, by the Langmuir-Blodgett method, on a flat metal surface and friction between this surface and a clean slider of the same metal was measured. The minimum number of layers required to provide effective lubrication depends on the compound and metal used. Temperatures at which these deposited layers cease to lubricate were determined. 15 ref.

25A-141. (Book) **Elementary Metallurgy and Metallography.** Arthur M. Shrager. 297 pages. 1949. MacMillan Co., 60 Fifth Ave., New York, N. Y. $4.75.

Covers underlying principles and the techniques of modern metallurgy. Physics and chemistry of metals. Sources of metals and methods of extracting them; properties and uses of finished products; and methods of controlling and testing.

25A-142. (Book) **Conveyors and Related Equipment. Ed. 2.** Wilbur G. Hudson. 461 pages. 1949. John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y.

Use and application of the various types of conveyors.

25A-143. (Book) **Allgemeine Metallurgie.** (General Metallurgy.) Max Hansen, editor. 295 pages. 1948. Office of Military Government for Germany. (FIAT Review of German Science, 1939-1946.)

Presented in eight sections by various authors. Sections are abstracted separately. Reviews German literature for 1939-46.

25A-144. Pacific Northwest—1960. Ivan Bloch. *Chemical Engineering,* v. 56, Sept. 1949, p. 108-111.

Predicts future production of a variety of heavy chemicals, metals, fertilizers, etc.

25A-145. The Metal Stockpiling Program. A. B. Quinton. *Metals,* v. 20, Sept. 1949, p. 10-12.

Policy and importance of stockpiling materials, only a few of which are available in the United States.

25A-146. Radioactive Tracers in Metallurgical Research. E. S. Kopecki. "Constructive Uses of Atomic Energy" (Harper and Bros.), 1949, p. 101-111.

Previously abstracted from *Iron Age.* (See item 25-131, 1947.)

25A-147. The Interrelation of the Engineering and Metallurgical Industries. Arthur P. M. Fleming. *Proceedings of the Institute of British Foundrymen,* v. 41, 1947-1948, p. B1-B7.

The steam turbine, rotor development, testing methods, jet-engine problems, noncorrodible steels, electric furnaces, arc welding, powder metallurgy, and atomic research and its application to metallurgy.

25A-148. Co-operative Research Activities. *Metallurgia,* v. 40, Sept. 1949, p. 257-272.

Presents brief report of research and development by British associations as follows: British Iron and Steel Research Assoc.; British Non-Ferrous Metals Research Assoc., W. L. Hall; British Cast Iron Research Assoc., J. G. Pearce; British Ceramic Research Assoc., A. E. Dodd; and British Welding Research Assoc., W. K. B. Marshall.

25A-149. Condensed Review of Some Recently Developed Materials Arranged Alphabetically by Trade Names. *Machinery,* v. 56, Oct. 1949, p. 162-174.

Information on a wide variety of alloys, solders, metal-working compounds, ceramics, plastics, coatings, oils, detergents and inhibitors.

25A-150. (Book) **Mines Register.** Vol. 23. Joseph Zimmerman, editor. 731 pages. Atlas Publishing Co., 425 W. 25th St., New York 1, N. Y.

Latest information on mining companies located in the western hemisphere that produce precious, semiprecious and base metals. A special section is devoted to a selective list of mining companies located in other parts of the world. Includes statistical tables.

25A-151. (Book) **Metallurgy for Engineers.** Ed. 2. E. C. Rollason. 339 pages, 1949. Edward Arnold & Co., London, 16s.

New and enlarged edition includes new developments and problems, such as heat resisting steels, brittle fracture, failure of welded ships,

atomic structure of metals. Condensed description of metallurgical theory and practice for engineering students.

25A-152. A Review of Current Alloy Casting Research. E. A. Schoefer. *Industrial Heating,* v. 16, Oct. 1949, p. 1771-1774, 1776, 1778.

Several research programs at Ohio State University, Battelle Memorial Institute, and elsewhere, for Alloy Casting Institute. Programs are on corrosion, on cast alloys for heat resistant service requiring development of a new thermal-fatigue test, and on welding characteristics of cast alloys and welding-rod compositions.

25A-153. Chemical Resources of the Western States. *Chemical and Engineering News,* v. 27, Oct. 17, 1949, p. 3000-3023.

Symposium summarizes the metallic and nonmetallic mineral positions of 11 states: "Arizona", Eldred D. Wilson and George H. Roseveare; "California", Olaf P. Jenkins and Charles V. Averill; "Colorado", Rolle Rand; "Idaho", Lewis S. Prater; "Montana", Perry F. Roys; "Nevada", Kenneth Frogley; "New Mexico", (anon.); "Oregon", F. W. Libbey; "Utah", Arthur L. Crawford; "Washington", J. V. Rogers, and "Wyoming", Jean L. Geyer.

25A-154. Some Aspects of Mineral Adequacy. Edward Sampson. *Canadian Mining and Metallurgical Bulletin,* v. 42 (*Transactions of the Canadian Institute of Mining and Metallurgy,* v. 52), p. 570-577.

Broad viewpoints on basis of national power, soils and fertilizers, energy resources, and mineral resources. Per capita production curves for the U. S. and for the world as a whole from about 1840 to date. Locations of major lead, copper, iron, phosphate, and potash resources.

25A-155. Die Anwendung kernphysikalischer Arbeitsverfahren im Eisenhüttenwesen. (The Application of the Nuclear-Physics Methods in Metallurgy.) Otto Rüdiger. *Stahl und Eisen,* v. 69, Sept. 15, 1949, p. 671-676.

Uses of radioactive elements, stable isotopes, and neutron radiation.

25A-156. American Machinist Mid-Century Inventory of Metalworking Equipment Shows Obsolescence Trend Sharply Up. *American Machinist,* v. 93, Nov. 3, 1949, p. 129-223.

Data obtained by a questionnaire survey of over 50,000 production plants, also college and maintenance shops. The data are broken down in various ways and supplemented by textual analyses.

25A-157. The Road Ahead in Engineering. J. R. Van Pelt. *Mechanical Engineering,* v. 71, Nov. 1949, p. 917-920.

Technologic advancements using the evolution of the reciprocating steam engine as an example. Further work lies ahead in improving the blast furnace, controlling the properties of metals, in ceramics, etc. Research as the key to progress.

25A-158. Ultrasonics Has Wide Industrial Applications. *Product Engineering,* v. 20, Nov. 1949, p. 153-154.

Various present and potential metallurgical and nonmetallurgical applications.

25A-159. Research Organizations Serve All Industry. Benjamin Melnitsky. *Industry and Power,* v. 57, Nov. 1949, p. 100-102.

Research institutions, their function, scope, and methods of payment. Specific information on Armour, Battelle, Mellon, Midwest, and Southern.

25A-160. Government Wants To Help Mining Industry; Has No Desire To Control Mineral Output. James Boyd. *Metals,* v. 20, Oct. 1949, p. 6-7, 10.

Administration's position with respect to subsidy and incentive legislation; problems facing industry.

25A-161. Status of Strategic Metals. James P. Bradley. *Metals,* v. 20, Oct. 1949, p. 9-10.

Domestic strategic metal mines are high-cost producers; need high tariff protection against foreign producers and cartels.

25A-162. Selected List of References on Minerals and Related Subjects. D. G. Runner. *U. S. Bureau of Mines,* Information Circular No. 7521, Sept. 1949, 9 pages.

Lists books most commonly used and most generally available under the following headings: minerals, gems, rocks, geology, geomorphology, engineering geology, prospecting, mining engineering, microscopy, technical dictionaries, and miscellaneous.

25A-163. Suggested International Metallurgical Association. R. Seligman. *Engineering,* v. 168, Oct. 21, 1949, p. 415-416. A condensation.

Possible activities and advantages to be gained by formation of above.

25A-164. (Book) **Engineering Materials and Processes: Metals and Plastics. Ed. 2.** William Howard Clapp and Donald Sherman Clark. 526 pages. International Textbook Co., Scranton 9, Pa. $6.50.

Content is essentially the same as that of the first edition and presents a brief treatment of the physical

properties, processing, and uses of the principal engineering materials. Chapters on cooling curves and equilibrium diagrams, plastics, castings, and methods of joining metals have undergone the greatest change.

25A-165. (Book) **Sixth Semiannual Report of the Atomic Energy Commission.** 203 pages. 1949. U. S. Government Printing Office, Washington, D. C.

Reviews major developments in atomic energy programs. Considers the field of biology and medicine, particle accelerators, research in metals, accounting for materials, and finance.

25A-166. Metals in Relation to Living Standards in Industrially Under-Developed Countries. D. N. Wadia. *Journal of Scientific & Industrial Research,* v. 8, Oct. 1949, p. 389-394.

The growing depletion of the world's metallic mineral resources and trends in their use. Tendency toward increasing use of metals by countries which have heretofore been mainly suppliers. Metallic-mineral resources of the Far East and India. Estimates of requirements for industrial and agricultural development.

25A-167. Cyanide Hazards. Robert H. Duguid and Wesley C. Cox. *Metal Progress,* v. 56, Dec. 1949, p. 814-815.

Hazards, recommended precautions, symptoms, and treatments.

25A-168. The Fume and Dust Problem in Industry. Harry V. Welch. *Journal of Metals* (Transactions Section), v. 1, Dec. 1949 (*Transactions of the American Institute of Mining and Metallurgical Engineers,* v. 185), p. 934-947.

Losses and/or values in suspended solids; particle size; dust and fumes in community and individual living; means and procedures for dust and fume collection; and equipment types used for dust and fume collection. 22 ref.

25A-169. (Book) **Metals Reference Book.** C. J. Smithells, editor. 735 pages. 1949. Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. $13.00. Also Butterworths Scientific Publications, Ltd., 4-6 Bell Yard, Temple Bar, London, W.C. 2, England. 60s.

Essentially a book of data. Descriptive matter is in general extremely short. Extractive and forming processes, with the exception of casting, are omitted; but data on joining processes are provided. Fundamental properties and also the lesser known properties.

25A-170. (Book) **Alloy Steels, Cast Iron and Non-Ferrous Metals.** F. Johnson. 227 pages. 1949. Chemical Publishing Co., 26 Court St., Brooklyn 2, N. Y. $5.00.

General aspects of production processes and their relation to properties. Physical, chemical, and mechanical properties, as well as applications.

25A-171. (Book) **Chemical Constitution and Properties of Engineering Materials.** P. C. Carman. 894 pages. 1949. Edward Arnold & Co., London, England.

Metals and metallic corrosion, inorganic materials, organic materials, and service materials. The latter includes fuels and water. Discusses corrosion, heat treatment, tests, etc. Chapter bibliographies.

25B—Ferrous

25B-1. Carpenter Builds New Lab to Speed Up Development of New and Better Steels. *Iron Age,* v. 162, Dec. 16, 1948, p. 141.

Illustrates building and facilities.

25B-2. Practical Metallurgy for the Steel Mill Engineer. W. B. McFerrin. *Iron and Steel Engineer,* v. 25, Dec. 1948, p. 61-71; discussion, p. 71-74.

Several methods of processing which have been developed during the past 5 to 20 years and are being applied to parts subject to fatigue, wear, and stress corrosion. Properties and applications of different types of alloy steels and cast irons. 11 ref.

25B-3. The Steel Shortage—How Long? Vance Bell and John S. Morgan. *Steel,* v. 124, Jan. 3, 1949, p. 143-145.

Future prospects.

25B-4. World Steel. S. D. Smoke. *Iron Age,* v. 163, Jan. 6, 1949, p. 190-197.

Statistics and information on the iron and steel industry throughout the world.

25B-5. Western Steel. R. T. Reinhardt. *Iron Age,* v. 163, Jan. 6, 1949, p. 258-265.

Despite a 300% increase in steel-making capacity over the past 9 years, the West Coast remains a steel-short area. The balance sheet of this fast growing section is studied.

25B-6. Developments in the Iron and Steel Industry During 1948. I. E. Madsen. *Iron and Steel Engineer,* v, 26, Jan. 1949, p. 94-117.

25B-7. A Brief History of Alloy Steel. Carl A. Zapffe. *American Society for Metals,* 1948, 27 pages. Reprinted from *Metal Progress,* v. 54, Oct. 1948, p. 459-467.

A review of the development of the industrial and engineering aspects.

25B-8. Planning a Steel Mill Lubrication Program. W. M. Schuck. *Lubrication Engineering,* v. 5, Feb. 1949, p. 10-14.

25B-9. Flow Chart of Raw Materials & Finished Products in 1948. J. C. Sullivan. *Steel,* v. 124, Feb. 7, 1949, p. 100.

Unique chart shows tonnages at each step from coal, ore, limestone, gas, electric power, water, etc.; through intermediate products like pig iron, coke, semifinished steel, to finished products, which are tabulated under type of product and type of industry receiving direct mill shipments.

25B-10. Plan for East Coast Steel Plant. Harold A. Knight. *Journal of Metals,* v. 1, sec. 1, Feb. 1949, p. 6-9.

Economic possibilities.

25B-11. Mining Gear Failures From a Metallurgical Aspect. R. Jeffrey. *Colliery Guardian,* v. 178. Jan. 20, 1949, p. 69-74; Jan. 27, 1949, p. 129-132.

In 1932 the Safety in Mines Research Board began to examine mining equipment found to be defective or which had failed in service. Results of examinations and of research.

25B-12. Sonderstahlguss fur hohe Festigkeitsbeanspruchungen. (Special High-Strength Cast Steels.) Karl Roesch. *Die Neue Giesserei,* v. 33-35 (new ser., v. 1), Aug. 1948, p. 39-41.

Chromium alloy steels, their compositions, methods of melting and casting, cooling, heat treating, and physical properties.

25B-13. The Steel Industry in 1948. R. C. Todd. *Journal of American Zinc Institute,* v. 26, 1948, p. 23-30; discussion, p. 31.

Statistics; political attacks on the steel industry.

25B-14. Ship 84,693,010 Gross Tons Lake Superior Iron Ore in 1948. *Skillings' Mining Review,* v. 37, Mar. 12, 1949, p. 1-2.

Amounts shipped from each mine are tabulated along with comparative figures for 1947.

25B-15. The Steel Industry in Soviet Russia. *British Steelmaker,* v. 15, Feb. 1949, p. 60-65.

Information concerning the Mar. 1946 5-yr. plan and progress to date.

25B-16. Review of Iron and Steel Literature for 1948. E. H. McClelland. *Blast Furnace and Steel Plant,* v. 37, Feb. 1949, p. 217-219, 248-249, 251, 253, 255.

32nd annual review of iron and steel literature compiled for *Blast Furnace and Steel Plant.* Concerned only with separately published books and pamphlets.

25B-17. Manganese Iron. P. F. Hancock. *Foundry Trade Journal,* v. 86, Feb. 3, 1949, p. 91-96.

Various types and compositions; foundry practice; heat treatment; mechanical and physical properties; metallographic structure; applications.

25B-18. How Much Steel Capacity? *Steel,* v. 124, Mar. 21, 1949, p. 69-80.

Current thinking pertaining to steelmaking capacity as it relates to production and prospective consumption. Includes investigation by William C. Buell, Jr.; reports by Wilfred Sykes, Louis H. Bean, Bradford B. Smith, Otto Brubaker.

25B-19. Steel for the West. F. B. DeLong. *Wire and Wire Products,* v. 24, Mar. 1949, p. 248-249, 278-281.

Economic problems.

25B-20. (Book) **Directory Giving List of Companies and Officials Operating Blast Furnaces, Steel Plants, Rolling Mills, By-Product Coking Plants, Structural Steel Plants, Boiler and Tank Shops in the United States and Canada.** 462 pages. 1949. Steel Publications, Inc., 108 Smithfield St., Pittsburgh 30, Pa.

25B-21. Die Energiekosten eines gemischten Eisenhuttenwerkes und ihre Verrechnung auf die Erzeugnisse. (The Cost of Energy Consumed in a Steel Plant and the Distribution of the Costs to the Products.) Kurt Rummel. *Stahl und Eisen,* v. 68, Aug. 12, 1948, p. 294-301.

25B-22. Planung grosstechnischer Sauerstoffanlagen. (Planning Large Commercial Oxygen Plants.) Ernst Karwat. *Stahl und Eisen,* v. 68, Dec. 2, 1948, p. 453-465.

Planning the above requires a survey of the required degree of purity and saleable amount of oxygen. Calculations on the estimated oxygen requirements of metallurgical industries. Graphs and tables indicate the energy required to separate the oxygen from air. Layout of an oxygen plant.

25B-23. Italian Steelmakers Aim at Modern Plant, Competitive Prices. Bill Packard. *Iron Age,* v. 163, Apr. 14, 1949, p. 130-132.

Plans of "Finsider," a semi-official group of Italian steel producers. Integrated plants are slated to play an important role in future of the industry.

25B-24. Rank of L. S. Iron Ore Producers in 1948. *Skillings' Mining Review,* v. 37, Apr. 9, 1949, p. 1, 4.

Iron-ore shipments of 28 companies from 164 mines. Rank and gross tons shipped in 1918, 1928, and 1938.

25B-25. (Book.) **Stahl-Handbuch.** (Iron and Steel Handbook.) Walther Hiller. 326 pages. R. Bohmann, Industrie und Fachverlag, Doblhoffgasse 5, Vienna I, Austria. $3.80.

Encyclopedia reviews metallurgical principles, alloys of steel, steel for special purposes, manufacture of steel, heat treatment, physical properties. Primarily intended for tool engineers, machine designers.

25B-26. A Decade of Expansion at Bethlehem's Sparrows Point Plant. T. J. Ess. *Iron and Steel Engineer,* v. 26, Apr. 1949, p. B1-B23.

Equipment, procedure, and production.

25B-27. Review of Iron and Steel Literature for 1948. E. H. McClelland. Carnegie Library of Pittsburgh, 1949, 28 pages.

Previously abstracted from *Blast Furnace and Steel Plant.* See item 25B-16, 1949.

25B-28. A Report by the *Iron Age* to the Metalworking Industry: Steel Consumption in 1948. Oliver Johnson. *Iron Age,* v. 163, May 26, 1949, insert between p. 72 and 73.

Typical portion of detailed study of geographic pattern of distribution of finished steel. Data cover use of 10 classifications in 48 state areas and 68 industrial areas. The complete report, which is available gratis, on request, is illustrated by data for Ohio and the Cleveland area.

25B-29. Always More Production. S. J. Cort. *Iron and Steel Engineer,* v. 26, May 1949, p. 95-98.

Trends and future prospects of the iron and steel industry.

25B-30. (Book) **Chernaya Metallurgiya v Novoi Pyatiletke.** (Ferrous Metallurgy in the New Five-Year Plan.) I. P. Bardin and N. P. Bannyi. 176 pages. 1947. Institute of Metallurgy, Academy of Sciences of the USSR, Moscow and Leningrad.

The present position of ferrous metallurgy in the U.S.S.R. and in foreign countries. On the basis of available data on raw material reserves, the goal and the means of achievement of the new 5-year plan are indicated. Planned production of ferrous metal at the end of 1950. Contains little concrete data concerning past performance.

25B-31. The Future Locational Pattern of Iron and Steel Production in the United States. Walter Isard and William M. Capron. *Journal of Political Economy,* v. 57, Apr. 1949, p. 118-133. (Reprint.)

Tentative generalizations. Fuel economies, ore reserves, scrap supply, transportation, labor, and market. 53 ref.

25B-32. Austenitic Manganese Steel. Howard S. Avery. *American Brake Shoe Co.,* 1949, 50 pages.

Originally prepared for the American Society for Metals' 1948 edition of the Metals Handbook, where a somewhat condensed version may be found. The alloys, applications, structure, properties, machining, working, and welding. 33 ref.

25B-33. Steel's Problems and Prospects. Walter S. Tower. "Yearbook of the American Iron and Steel Institute, 1948", p. 67-76.

See abstract of "Position of Steel in 1948", *Mining and Metallurgy,* item 25B-62.

25B-34. Production Swells at Fontana. *Western Machinery and Steel World,* v. 40, July 1949, p. 90-91.

New steel-production facilities.

25B-35. What's Left of Japan's Iron and Steel Industry? Joseph Z. Reday. *Steel,* v. 125, Aug. 8, 1949, p. 68-72, 94, 96.

Appraises the current status and future competitive position of the industry in terms of physical and economic realities.

25B-36. (Book) **Yearbook of the American Iron and Steel Institute.** 689 pages. 1948. The Institute, 350 Fifth Ave., New York 1, N. Y.

Proceedings of the 56th general meeting held in New York, May 26-27, 1948. Most of the individual papers have been previously abstracted.

25B-37. (Book) **How Steel Is Made.** 63 pages. 1948. Inland Steel Co., 38 So. Dearborn St., Chicago 3, Ill.

Story of steel from the ore to the product in nontechnical language.

25B-38. (Book) **Alloy Steels.** J. Winning. 72 pages. 1948. Emmot & Co., Ltd., 31 King St., West, Manchester, England. 2s., 6d.

Metals are classified according to type so that non-standard alloys may be fitted into their appropriate class. Structural steels and physical properties. Carburizing steels including typical applications of structural steels and also deals with case-hardening and nitriding. High-speed carbon and low-alloy tool-steels. Some notes on sintered alloys. Stainless and heat resisting steels are described under their ferritic and austenitic types respective-

ly. Notes on the selection of alloys for specific purposes. Machinability of steels and a static method of measuring the susceptibility of steel to cold working.

25B-39. (Book) **Steel Making in America.** Douglas A. Fisher. 101 pages. 1949. U. S. Steel Corp., 71 Broadway, New York 6, N. Y.

A nontechnical treatment of the history, manufacture, and uses of steel.

25B-40. Aliquippa Works: Jones & Laughlin Steel Corporation. Charles Longenecker. *Blast Furnace and Steel Plant,* v. 37, Aug. 1949, p. 927-960.

Extensive illustrated description of the coke, iron, and steel melting departments, the blooming, billet, bar, and finishing mills, and auxiliaries.

25B-41. Sheet, Strip and Tinplate Industry in Western Europe. Paul Damiron. *Iron and Steel Engineer,* v. 26, Aug. 1949, p. 75-79; discussion, p. 79-81.

An economic survey.

25B-42. Prescribed Lubrication for Iron and Steelmaking Equipment. A. F. Brewer. *Steel,* v. 125, Sept. 12, 1949, p. 106-109, 146.

Lubrication of machinery prior to rolling. Load and dirt problems, openhearth lubrication, requirements of lubricants, and trend toward centralized lubrication.

25B-43. Steel Products Manual. Sec. 16. Carbon Steel Wire. Sec. 28. Alloy Steel Wire. *American Iron and Steel Institute,* 1949, 174 and 83 pages.

Metallurgical aspects, manufacturing practices, chemical requirements, and packaging, marking, and loading methods. Commodity descriptions.

25B-44. (Book) **Stainless Steels.** Carl A. Zapffe. 368 pages. 1949. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $5.00.

Reviews historical background and discusses corrosion resistance, metallurgical constitution, production, fabrication, and finishing. Includes chapters on martensitic, ferritic, and austenitic stainless steels. 316 ref.

25B-45. (Book) **The Yearly Proceedings of the Association of Iron and Steel Engineers.** 932 pages. 1949. Association of Iron and Steel Engineers, Empire Bldg., Pittsburgh 22, Pa.

All of the papers have already appeared in *Iron and Steel Engineer* and have been abstracted individually.

25B-46. (Book) **"Shock-Proof" Malleable Castings.** 92 pages. 1949. Lake City Malleable Co., 5000 Lakeside Ave., Cleveland.

An illustrated brochure on malleable iron castings made by this company. Design principles, properties, foundry and finishing procedures, applications.

25B-47. A Metallurgical Examination of a Cast-Iron Cannon Ball. J. E. Hurst and R. V. Riley. *Foundry Trade Journal,* v. 87, Sept. 1, 1949, p. 261-266.

Chemical composition, hardness, microstructure, and macrostructure of a 17th-century cannon ball.

25B-48. Pittsburgh Forgings Company —A Study in Progress. John C. McComb. *Steel Processing,* v. 35, Sept. 1949, p. 474-475.

Production and organization of this company. Steel yards, die shop, forge shops, power supply, production machining, heat treating department, inspection department, painting department, metallurgical department, maintenance, and assembly shop.

25B-49. High Strength, Low Alloy Steels. *Product Engineering,* v. 20, Oct. 1949, p. 89-95.

Composition, properties, forming characteristics, corrosion resistance, heat treatment, and applications.

25B-50. Iron, Mild Steels, and Low Alloy Steel. C. P. Larrabee and S. C. Snyder. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2122-2124.

Summarizes information published since 1947. 27 ref.

25B-51. Stainless Steels and Other Ferrous Alloys. M. H. Brown and W. B. DeLong. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2139-2146.

Reviews literature since 1947. Properties, structure, corrosion, and welding. 194 ref.

25B-52. Steel in the Competitive 50's. *Modern Industry,* v. 18, Oct. 15, 1949, p. 38-43.

Present trends and future prospects. How new processes, materials, and services affect the picture. The iron-ore and the steel-capacity problem. New processes, equipment, and applications.

25B-53. (Book) **The Ferrous Metal Industry in Germany.** G. Patchin and Ernest Brewin. Published for British Intelligence Objective Subcommittee by H. M. Stationery Office, York House, Kingsway, London W. C. 2, England. 4s, 6d.

Condensed report of publications for the years 1939-1945.

25B-54. New Laboratory Concentrates on Steel Valve Research. *Steel,* v. 125, Nov. 7, 1949, p. 122, 124, 150.

Laboratory and equipment at Edward Valves, Inc., for testing all types of valves and valve materials.

25B-55. Trends in Iron and Steel Forgings—Castings. A. B. Tietjen. *Western Machinery and Steel World,* v. 40, Nov. 1949, p. 96-97.

Economic trends from the Western U. S. viewpoint.

25B-56. Research in the French Iron and Steel Industry. *Metal Treatment and Drop Forging,* v. 16, Autumn 1949, p. 164-170.

French research organizations and personalities. Résumés of papers presented at a recent meeting in Paris of Société Française de Métallurgie.

25B-57. Metallurgical and Property Relationships in Stainless Steels. Samuel J. Rosenberg. *Product Engineering,* v. 20, Dec. 1949, p. 81-86.

First of two articles giving a basic review of the metallurgy of stainless steels, relating fundamental considerations to heat treatment, properties, fabrication methods and uses.

25B-58. Science; Application to the Products of the Steel Industry. W. Barr. *Iron and Steel,* v. 22, Nov. 22, 1949, p. 519-524.

Examples of the development of new and better products include improvement of notch ductility of mild steel for shipbuilding and structural work; evolution of weldable high-tensile steels; steels for high-temperature service; and stainless-clad steels. Method of making the latter, and effects of composition, structure and heat treatment on mechanical properties.

25B-59. (Book) **Republic Alloy Steels.** 383 pages. 1949. Republic Steel Corp., Republic Bldg., Cleveland.

Hardenability, properties, heat treating, transformation, testing procedures, and applications. Chapter bibliographies.

25C—Nonferrous

25C-1. Surface-Active Agents; Applications in Non-Ferrous Metals Technology. J. Koerner. *Metal Industry,* v. 73, Dec. 3, 1948, p. 452-453.

See abstract of "Surface Agents As Applied in Non-Ferrous Metal Technology", publication of National Lead Co. Research Laboratories, Brooklyn, N. Y., item 26c-8, 1948.

25C-2. The Lithium Industry. R. B. Ellestad. *Canadian Mining and Metallurgical Bulletin,* v. 41 (*Transactions,* v. 51), Nov. 1948, p. 619-622.

Chemistry; occurrence; extraction; and uses in electrochemistry, air conditioning, metallurgy, organic chemistry, ceramics. 17 ref.

25C-3. Stockpiling Aggravates Nonferrous Shortages. F. R. Briggs. *Steel,* v. 124, Jan. 3, 1949, p. 146-147.

Present status and future prospects.

25C-4. Nonferrous Metals. John Anthony. *Iron Age,* v. 163, Jan. 6, 1949, p. 266-273.

Present economic status and future prospects.

25C-5. Titanium. Bruce W. Gonser. *Journal of Metals,* v. 1, sec. 1, Jan. 1949, p. 6-9.

Occurrence and ores, process metallurgy, physical metallurgy, properties, applications, and present status and future prospects for commercial development.

25C-6. Copper and Copper Alloys; Technical Progress in 1948. E. Voce. *Metallurgia,* v. 39, Dec. 1948, p. 75-80.

47 ref. (To be continued.)

25C-7. The Birth of an Alloy. The Development of Nimonic 80 by the Mond Nickel Company, Limited. D. G. P. Paterson. *Sheet Metal Industries,* v. 25, Oct. 1948, p. 2029-2037.

Research facilities and organization of British company. History of the development of the above turbine-blade alloy, composition of which is 19-22% Cr, 1.5-3.0% Ti, 0.5-1.5% Al, 5.0% Fe max., 1.0% Mn max., 1.0% Si max., 0.1% C max., balance Ni.

25C-8. Copper and Copper Alloys; Technical Progress in 1948. (Concluded.) E. Voce. *Metallurgia,* v. 39, Jan. 1949, p. 146-148.

A review. This section deals with plating and finishing, properties, corrosion, and analysis and testing. 36 ref.

25C-9. What's Ahead for Metals in the Farm Market. R. D. Stewart. *Journal of American Zinc Institute,* v. 26, 1948, p. 13-16.

An economic analysis, with emphasis on galvanized-steel products.

25C-10. The Zinc Smelting Industry in the United States. R. A. Young. *Journal of American Zinc Institute,* v. 26, 1948, p. 31-39.

Statistics.

25C-11. Zinc Mining in the Western States. J. K. Richardson. *Journal of American Zinc Institute,* v. 26, 1948, p. 94-101.

Economic factors.

25C-12. Zinc Mining in the Central

States. O. W. Bilharz. *Journal of American Zinc Institute,* v. 26, 1948, p. 102-105.

Economic factors, including statistics.

25C-13. Zinc Mining in the Eastern States. R. J. Mechin. *Journal of American Zinc Institute,* v. 26, 1948, p. 105-113.

Economic factors, including statistical graphs.

25C-14. The World Situation in Zinc. S. D. Strauss. *Journal of American Zinc Institute,* v. 26, 1948, p. 114-125; discussion, p. 125-126.

Includes statistical table.

25C-15. Metallurgy and Utility of the Less Common Metals. D. J. Maykuth. *Metals Review,* v. 22, Feb. 1949, p. 5-8.

Developments of the past year in Ti, Zr, W, Ta, Cb, U, Th, Be, and other metals. Also reviews articles on metallurgical applications of radioactive tracers. (References to "A.S.M. Review of Metal Literature".

25C-16. Mine Production of Copper in the United States in 1948. *Skillings' Mining Review,* v. 37, Feb. 19, 1949, p. 1, 4.

Statistics by states.

25C-17. U. S. Ready to Prove It Can Do Without Russian Manganese. George F. Sullivan. *Iron Age,* v. 163, Mar. 10, 1949, p. 151-152.

25C-18. Copper Outlook, Production, Demand, Price. Joseph W. Mullally. *Metals,* v. 19, Feb. 1949, p. 7, 9.

25C-19. Stockpiling, Rearmament Will Affect Lead. R. L. Ziegfeld. *Metals,* v. 19, Feb. 1949, p. 10-11.

25C-20. Outlook for Nonferrous Metals. Simon D. Strauss. *Mining Congress Journal,* v. 35, Feb. 1949, p. 38-41.

An economic survey.

25C-21. Ferroalloys and Other Strategic Metals. S. H. Williston. *Mining Congress Journal,* v. 35, Feb. 1949, p. 66-68.

Present economic status and trends.

25C-22. Doemstic Silver Production Largest Since 1943. Pat McCarran. *Mining Congress Journal,* v. 35, Feb. 1949, p. 107-109.

Statistics and economic factors.

25C-23. Review of Zinc Industry for Year 1948. Part I. (To be concluded.) Ernest V. Gent. *Metals,* v. 19, Feb. 1949, p. 12-13.

Includes tabular data.

25C-24. (Book) **Metal Industry Handbook and Directory for 1948.** 480 pages. Louis Cassier Co., Ltd., Dorset House, Stamford St., London, S.E.1, England.

An encyclopedia of British nonferrous metals and electroplating. Divided into four sections: general properties and mechanical treatment of metals and alloys; general data and tables; electroplating; and directory.

25C-25. World Position of Non-Ferrous Metals. Ralph L. Wilcox. *Metals,* v. 19, Mar. 1949, p. 9-11.

Report from Non-Ferrous Metals Branch, Economic Cooperation Administration.

25C-26. Review of Zinc Industry for Year 1948. Part II. (Concluded.) Ernest V. Gent. *Metals,* v. 19, Mar. 1949, p. 12.

25C-27. Bibliography on Production & Properties of Titanium. Charles S. DuMont. *Metal Progress,* v. 55, Mar. 1949, p. 368, 398, 400, 402, 404.

References are derived mainly from the author's 180-page bibliography published in 1947. 20 additional references are given. Classified as general, production, and properties. 114 ref.

25C-28. (Book.) **The First Hundred Years of the New Jersey Zinc Company.** 69 pages. 1948. New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

Reviews founding and development of the company.

25C-29. Canadian Non-Ferrous Metals. A. M. Tedford. *Canadian Chemistry and Process Industries,* v. 33, Apr. 1949, p. 333-335.

A brief survey.

25C-30. 1948 Gold Production in the United States. *Skillings' Mining Review,* v. 38, Apr. 23, 1949, p. 1, 6, 9.

A statistical review by states.

25C-31. The Business of Titanium Metal. *Fortune,* v. 39, May 1949, p. 124, 126, 128.

Position of leading companies engaged in the development of titanium.

25C-32. Outlook for Slab Zinc Supply in 1949. Howard I. Young. *Metals,* v. 19, Apr. 1949, p. 7-8.

U. S. has adequate productive facilities to take care of all domestic, government stockpile, and emergency foreign needs.

25C-33. (Book) **Bibliography of the Platinum Metals, 1931-1940.** James Lewis Howe and others. 248 pages. 1949. Baker & Co., Inc., Newark, N. J.

About 7000 references arranged alphabetically by author within each of the ten years covered. Includes patent references and a subject index. Brief annotations or ex-

planatory phrases are provided in many cases.

25C-34. Copper and Its Alloys; Report on Some Recent British Advances. E. Voce. *Metal Industry,* v. 74, Apr. 29, 1949, p. 330-332; May 6, 1949, p. 366, 368.

37 references.

25C-35. Tin, A World Anxiety. *Mining World,* v. 11, May 1949, p. 36-40.

Production of tin by countries. Unstable domestic conditions and price problems as related to available supply.

25C-36. World Sales of Nickel in 1948 Amounted to 240,098,274 Pounds; Exceeded 1947 Total. Robert C. Stanley. *Metals,* v. 19, May 1949, p. 7, 9, 12.

Presents statistics and urges removal of U. S. import duty on copper.

25C-37. Outlook for Zinc Markets Is Promising. R. G. Kenly. *Metals,* v. 19, May 1949, p. 10-12.

25C-38. Various Aspects of Titanium Metals. R. S. Stewart. *Canadian Mining Journal,* v. 70, June 1949, p. 59-66.

Resources, production, properties, applications, and the Ti-base alloys. 32 ref.

25C-39. The Shifting Scene in Lead Market. Robert L. Ziegfeld. *Metals,* v. 19, June 1949, p. 11-12, 14.

Economic trends.

25C-40. Should Copper Enter U. S. Duty Free? "Yes" Say Consumers of the Metal. C. Donald Dallas and Roger E. Gay. **"No" Says Arizona Copper Tariff Board.** *Metals,* v. 19, June 1949, p. 6-7, 9-10.

25C-41. Recent Developments in Titanium and Titanium Alloys. *Steel,* v. 124, June 20, 1949, p. 100-104, 132, 135; June 27, 1949, p. 58-61, 92, 94.

Developments reported at recent technical meetings.

25C-42. America's Stake in World Mineral Resources. Alan M. Bateman. *Mining Engineering,* v. 1, sec. 1, July 1949, p. 23-27.

War minerals imported, shortages in reserves, foreign sources needed, politics abroad and their threat to supplies, need for mineral foreign policy, and trade barriers.

25C-43. Twenty-Ninth Annual Report. *British Non-Ferrous Metals Research Association,* June 1949, 52 pages.

Review of research progress for 1948-49 under the headings; copper, nickel and their alloys; aluminum, magnesium and their alloys; lead, tin and their alloys; zinc and galvanizing; and general research. Also outlines research in progress.

25C-44. (Book) **Nichteisen-Metallkunde.** (Non-Ferrous Metallurgy). Part I. Max Hansen, senior author. 207 pages. 1948. Office of Military Government for Germany. (FIAT Review of German Science, 1939-1946.)

Presents material in two sections, each consisting of reviews of specific topics by individual authors, and covering German work during the above period. The first deals with the production and refining of nonferrous metals. Separate subsections cover Ca, Be, Mg, Al, Ti, Zr, Th, U, Mn, Ni, Cu, Zn, Cd, In and Th, Si, Pb, Sb, light-metal-scrap treatment and refining, and metal production by hydrogen reduction from oxides which are difficult to reduce. The second gives details of properties and processing of Be, Mg, Al, and their alloys. Voluminous footnote references indicate all original sources.

25C-45. (Book) **Nichteisen-Metallkunde.** (Nonferrous Metallurgy.) Part II. Max Hansen, senior author. 171 pages. 1948. Office of Military Government for Germany. (FIAT Review of German Science, 1939-1946.)

Second of two volumes. Part of a series reviewing all branches of German science for the above period. Individual topics are reviewed by separate authors. Main topics are Ni and Ni alloys; Cu and Cu alloys; precious metals and their alloys; Zn and Zn alloys; Pb and Pb alloys; bearing metals; powder metallurgy and sintered materials; and melting and casting in vacuum. Besides voluminous footnote references, the book concludes with a 4½-page book bibliography.

25C-46. (Book) **Year Book of the American Bureau of Metal Statistics.** Ed. 28. 112 pages. 1949. American Bureau of Metal Statistics, 50 Broadway, New York.

Production, consumption, and operation data; data on imports and exports of the U. S. and the United Kingdom; and price data for copper, lead, and zinc. Some data on gold, silver, and various other metals.

25C-47. Titanium—The Metal With a Future. *Engineering and Mining Journal,* v. 150, July 1949, p. 119-123.

Future prospects for commercial utilization of titanium. Appraisal of titanium's properties and potential uses, by H. C. Cross; and a survey of ore reserves.

25C-48. Recent Production and Productivity of United States Non-Ferrous Metal Mines. Jesse L. Maury. *Mining World,* v. 11, July 1949, p. 15-17.

25C-49. Leading Producers of Copper in 1948. David N. Skillings. *Skillings Mining Review,* v. 38, July 23, 1949, p. 1, 4, 13.

Data for 25 leading companies and brief summaries of activities for 15 of them.

25C-50. The Bureau of Aeronautic's Titanium Program. N. E. Promisel. Office of Naval Research, "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 5-11; discussion p. 11.

See abstracts from *Metal Progress,* items 3C-58 and 25D-6, 1949.

25C-51. The Program of the Air Materiel Command on Titanium Alloys. Richard R. Kennedy. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 12.

See listing from *Metal Progress,* item 25D-8, 1949.

25C-52. The Titanium Program of Army Ordnance. Laurence S. Foster. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 18-19; discussion p. 19.

Previously listed from *Metal Progress,* item 25D-7, 1949.

25C-53. The Titanium-Base Alloys Program of the Naval Research Laboratory. E. J. Chapin. *Office of Naval Research,* "Titanium; Report of Symposium on Titanium", Mar. 1949, p. 144-150; discussion p. 150-151.

See abstract from *Metal Progress,* item 25D-9, 1949.

25C-54. Titanium Alloys for Aircraft. Nathaniel F. Silsbee. *Aero Digest,* v. 59, Aug. 1949, p. 38-39, 106, 108, 110.

Recent research and potentialities.

25C-55. (Book) **Tin; Its Mining, Production, Technology, and Applications. Ed. 2.** C. L. Mantell. 573 pages. 1949. Reinhold Publishing Corp., 330 W. 42nd St., New York, N. Y.

New practices and procedures in connection with ores and ore deposits, mining and ore dressing, smelting and metallurgy, tin conservation, electrolytic tin plate, binary alloys, ternary and quaternary systems, hot-dip coatings, tin cans, foil and collapsible tubes, corrosion, and analytical methods. Special consideration to the use of secondary tin.

25C-56. (Book) **Titanium; Report of Symposium on Titanium.** 157 pages. Mar. 1949. Office of Naval Research, Washington 25, D. C.

Welcoming address, introduction, and 17 papers and accompanying discussion presented at meeting held Dec. 16, 1948. Individual papers are separately abstracted.

25C-57. Metallurgical Laboratory at Oak Ridge. L. K. Jetter and E. E. Stansbury. *Metal Progress,* v. 56, Aug. 1949, p. 187-193.

Newly completed laboratory designed for metallurgical studies of the heavy elements, the transuranium metals, and materials for reactors and power piles. Unusual precautions against radioactive and toxic hazards are provided, even though the level of radioactivity is rather low in this section.

25C-58. Titanium—Metal of the Future. Oliver C. Ralston. *Metals,* v. 20, Aug. 1949, p. 11-12.

Present status and widespread research and development.

25C-59. Tantalum. G. L. Miller. *Industrial Chemist and Chemical Manufacturer,* v. 25, Aug. 1949, p. 388-390.

Historical aspects of the element and its metallurgy, treatment of ores, production of the metal, properties, and applications of tantalum and its alloys.

25C-60. (Book) **Copper and Its Alloys in Engineering and Technology.** 88 pages. 1949. Copper Development Association, Kendals Hall, Radlett, Herts., England. Free of charge.

Describes in practical terms the various grades of copper; the alloys of copper and other metals; the brasses, bronzes and gun-metals; and their electrical, mechanical, and other properties. A series of tables classifies all these materials according to the type of service for which they are suitable.

25C-61. Thirty-Three Sources of Gold and Silver. David N. Skillings. *Skillings' Mining Review,* v. 38, Sept. 17, 1949, p. 1, 4.

Statistical data for 1948 production, plus brief description of major producers.

25C-62. Hafnium. Donald Ray Martin. *Foote Prints,* v. 21, no. 1, 1949, p. 8-12.

History, extraction, occurrence, reduction, physical properties, chemical properties, and applications. 45 ref.

25C-63. Wrought Copper and Copper-Base Alloys. C. L. Bulow. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2108-2114.

Reviews literature on the above since 1947. 114 ref.

25C-64. Lead and Its Alloys. G. O. Hiers. *Industrial and Engineering Chemistry,* v. 41, Oct. 1949, p. 2124-2125.

Reviews literature since 1947. 25 ref.

25C-65. Nickel and High-Nickel Alloys. W. Z. Friend. *Industrial and Engineer-*

ing Chemistry, v. 41, Oct. 1949, p. 2126-2132.

Reviews literature since 1947. Deals with alloys containing more than 40% Ni, or Ni plus Co. Developments, physical properties, and fabrication. 240 ref.

25C-66. The Technology of Copper-Lead Alloys. R. W. K. Honeycombe. *Transactions of the American Foundrymen's Society,* v. 56, 1948, p. 57-63; discussion, p. 64-65.

Previously abstracted from *Section of Tribophysics, Council for Scientific & Industrial Research, Commonwealth of Australia,* Physical Metallurgy Report No. 6. See item 4c-18, 1948.

25C-67. Our Next Major Metal—Titanium. *Product Engineering,* v. 20, Nov. 1949, p. 129-152.

What industry and researchers think of titanium; why use titanium; availability of the ore; production of the metal; mechanical properties of titanium; physical and chemical properties; fabrication techniques; and titanium alloys. 28 ref.

25C-68. The French Non-Ferrous Metal Industry. R. S. Lajeunesse. *Metal Industry,* v. 75, Oct. 14, 1949, p. 342-343.

Availability and production of various nonferrous metals.

25C-69. Unmanufactured Copper, Lead, and Zinc. *U. S. Tariff Commission,* July 1949, 58 pages.

Summarizes tariff information by type of material, country, and year. Annual and monthly consumption, production, imports, and exports in the U. S.

25C-70. Le Tungstène. (Tungsten.) Jean Challansonnet. *Métaux & Corrosion,* v. 24, July-Aug. 1949, p. 163-176.

Historical development, mineral sources, beneficiation, production, properties, metallurgy, fabrication, metallography and applications.

25C-71. (Book) **Titanium.** Jelks Barksdale. 590 pages. 1949. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. $10.

Occurrence, chemistry, and technology; many commercial applications including those of the oxide. Reviews the literature and includes 78-page bibliography.

25C-72. Program for Mining Industry. Elmer W. Pehrson. *Metals,* v. 20, Nov. 1949, p. 6-7, 9-10.

Recommends sound tariff structure to provide better incentives and larger stockpile goals for peacetime security.

25C-73. Sees Bright Outlook for Copper Market and Continuation of Tight Supply Situation. Joseph Zimmerman. *Metals,* v. 20, Nov. 1949, p. 11-12, 14.

25C-74. Bronzes de Aluminio. (Aluminum Bronzes.) Livio Euler de Araujo. *Boletim da Associaçao Brasileira de Metais,* v. 5, July 1949, p. 313-323.

A study of commercial Al bronzes. Influences of chemical composition, alloying elements, and heat treatment on mechanical properties and structures.

25C-75. Which Copper-Base Alloy? R. Carson Dalzell and Joseph J. Matt. *Machine Design,* v. 21, Dec. 1949, p. 125-134.

Mechanical, physical and working properties and applications of the various types.

25C-76. Les Cupro-Siliciums moulés. (Copper-Silicon Castings.) Georges Blanc. *Fonderie,* Oct. 1949, p. 1783-1789.

Review of the literature, covering physical and mechanical properties; foundry practice; applications; and French, British, and U. S. standards. 11 ref.

25D—Light Metals

25D-1. Research in the Non-Ferrous Industries of Great Britain. D. C. G. Lees. *Metal Treatment and Drop Forging,* v. 15, Winter 1948-9, p. 167-176.

Second of series deals mainly with research on Al and Mg. (To be continued.)

25D-2. Progress in Titanium Told at Naval Research Symposium. T. C. Du Mond. *Materials & Methods,* v. 29, Feb. 1949, p. 45-47.

Reviews proceedings of recent symposium. Illustrations show machined, formed, forged, and welded titanium.

25D-3. Aluminum Review. *Light Metal Age,* v. 7, Feb. 1949, p. 10-11, 18-19, 24.

Developments of 1948 in commercial production and applications. Procedures and equipment of Permanente Metals Corp., Mead, Wash.

25D-4. How to Avoid Watermarks on Aluminum. G. W. Birdsall. *Steel,* v. 124, Feb. 28, 1949, p. 86, 88.

Good storage practice which prevents stains left by chemical-loaded water.

25D-5. Titanium. *Metal Progress,* v. 55, Feb. 1949, p. 185-200, 252, 254.

Based on papers presented at a recent symposium sponsored by the Office of Naval Research. Four articles deal with titanium programs of the military agencies; seven with production and fabrication of the metal. Individual articles are abstracted separately.

25D-6. The Titanium Program of the Navy Bureau of Aeronautics. N. E. Promisel. *Metal Progress,* v. 55, Feb. 1949, p. 186.

25D-7. The Titanium Program of Army Ordnance. L. S. Foster. *Metal Progress,* v. 55, Feb. 1949, p. 187.

25D-8. The Titanium Program of the Air Materiel Command. Richard R. Kennedy. *Metal Progress,* v. 55, Feb. 1949, p. 187.

25D-9. The Titanium Program of the Naval Research Laboratory. E. J. Chapin. *Metal Progress,* v. 55, Feb. 1949, p. 188.

25D-10. Aluminum Metallurgy. Paul P. Zeigler. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 84-85.

1948 commercial and metallurgical developments.

25D-11. Magnesium Industry. J. D. Hanawalt. *Journal of Metals; Mining Engineering; Journal of Petroleum Technology,* v. 1, sec. 2, Mar. 1949, p. 86-87.

Metallurgical progress in electroplating, welding, and brazing, and other aspects.

25D-12. Aluminum. Donald M. White. *Mining Congress Journal,* v. 35, Feb. 1949, p. 106, 114.

Present economic status and trends.

25D-13. (Book) **The Story of Magnesium.** W. H. Gross. 260 pages. American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio. $1.50.

First of a series of "Techbooks" whose purpose is to provide non-engineering graduates with the technical information needed to understand properly the science of metals as it is applied in industrial production. Suitable for use as self-educational material.

25D-14. L'industrie suédoise de l'Aluminium. (Swedish Aluminum Industry.) Valde Oskarson. *Revue de l'Aluminium,* v. 26, Feb. 1949, p. 40-42.

Survey from 1921 to date. Method used, amount produced, and the main application of Al. Includes drawings and tables.

25D-15. Commercial Wrought Aluminum Alloys. J. A. Nock, Jr. *American Society for Metals,* "Physical Metallurgy of Aluminum Alloys," 1949, p. 167-199.

Alloy classification, heat treatable and non heat treatable wrought alloys, Alclad products, formability, welding and brazing, corrosion resistance, products available, and applications. 18 ref.

25D-16. (Book.) **Physical Metallurgy of Aluminum Alloys.** W. L. Fink, F. Keller, W. E. Sicha, J. A. Nock, Jr., and E. H. Dix, Jr. 247 pages, 1949. American Society for Metals, 7301 Euclid Ave., Cleveland, Ohio. $5.00.

A series of educational lectures. Individual lectures are abstracted separately.

25D-17. (Book.) **Aluminium.** (In Norwegian.) Jan Herman Reimers. 324 pages. 1947. Johan Grundt Tanum, Oslo, Norway.

A reference work suitable for use by research men or graduate students. All phases from production of metal to fabrication of primary shapes and finished products. Properties and applications. Norwegian installations.

25D-18. Japan's Light Metals Industry. Joseph Z. Reday. *Light Metal Age,* v. 7, Apr. 1949, p. 10-11, 32-33.

Development, present status and future prospects. Effects of SCAP controls.

25D-19. (Book) **Magnesium, Its Production and Use. Ed. 2.** Ernest V. Pannell. 189 pages. 1948. Sir Isaac Pitman & Sons, Ltd., 39 Parker St., Kingsway, London, W.C.2, England. $4.00.

Contains new information available since the removal of wartime restrictions in the period 1943-1946. The first part, dealing with the pure metal, covers general properties, sources, and methods for commercial extraction. The second part deals with alloys of magnesium and includes chapters on alloy compositions, heat treatment, casting, working, corrosion and protection, and industrial applications.

25D-20. Magnesium and Its Characteristics. T. R. B. Watson. *Canadian Mining Journal,* v. 70, May 1949, p. 72-75.

History, mineralogy, extraction, properties, alloys, heat treatment, inflammability, corrosion, and applications.

25D-21. The Magnesium Industry in 1948. W. S. Loose. *Modern Metals,* v. 5, May 1949, p. 13-14.

25D-22. The Magnesium Casting Industry; Its Problems and Outlook. Robert T. Wood. *Modern Metals,* v. 5, May 1949, p. 21-23.

Technical and economic problems, indicating advantages and disadvantages of sand-cast and permanent-mold types for various applications.

25D-23. Aluminum. R. L. Templin. *ASTM Bulletin,* May 1949, p. 45-47.

Resources, mining and extraction, alloys, properties, fabrication, and applications.

25D-24. Beryllium Poisoning. Robert J. Hasterlik. *Physics Today,* v. 2, June 1949, p. 14-17.

The effects which can cause acute lung disease. Precautions to be taken.

25D-25. Kaiser Aluminum: A Major Supplier in Three Short Years. W. B. Griffin. *Modern Metals,* v. 5, June 1949, p. 15-25.

Over-all organization and administration of firm as well as specific procedures and equipment used during the transition from bauxite to a large variety of finished products. Various examples of consumer products in aluminum.

25D-26. Some Notes on Aluminium and Its Alloys. F. A. Fox. *Machinery Lloyd* (Overseas Edition), v. 21, July 16, 1949, p. 68-80.

Properties, methods of production, and applications.

25D-27. The Bureau of Aeronautics' Magnesium Program. J. E. Sullivan. *Magazine of Magnesium,* Aug. 1949, p. 8-11.

Research program.

25D-28. The Light Metal Picture. Francis C. Frary. *Metal Progress,* v. 56, Aug. 1949, p. 204-208.

Distribution of aluminum capacity in the U.S. and recent trends in world production.

25D-29. Light Metals Economic Outlook. *Modern Metals,* v. 5, Aug. 1949, p. 17.

25D-30. Light Metals: Methods of Production; Present Applications; Future Prospects. H. Sutton. *Metal Industry,* v. 75, Aug. 26, 1949, p. 163-166.

A survey.

25D-31. Trends in High-Strength Wrought Aluminum Alloys. W. B. F. Mackay. *Metal Progress,* v. 56, Sept. 1949, p. 331-336, 404, 406.

Development and future possibilities. Believes that a commercial Cu-Mg-Zn-Al alloy having an ultimate tensile strength of 100,000 psi. will be eventually marketed. Production of a stronger alloy is more problematical. 23 ref.

25D-32. (Book) **The Technology of Aluminum and Its Light Alloys.** Ed. 3. Alfred von Zeerleder. 450 pages. High Duty Alloys, Ltd., Slough, Bucks, England. (Translated from the German.) £1, 1s.

See abstract of German edition, item 27d-9, 1948.

25D-33. Light Metals. *Chemical Engineering,* v. 56, Sept. 1949, p. 130-131.

Status and future prospects in the West.

25D-34. Aluminum and the Electrical Industry. Donald M. White. *Electrical Engineering,* v. 68, Nov. 1949, p. 928-933.

Economic and technological considerations, including parallel growth of aluminum and electrical industries, production of aluminum, electric equipment in aluminum-reduction plants, alloys useful in electrical industry, physical and mechanical properties of Al, and applications in electrical industry.

25D-35. Their Future. H. Sutton. *Light Metals,* v. 12, Oct. 1949, p. 564-572.

Present status of resources, production processes, and utilization of Al, Mg, and Be. 41 ref.

25D-36. Recent French Investigations in the Field of Light Alloys. Georges Chaudron. *Engineering,* v. 168, Oct. 14, 1949, p. 403-405. A condensation.

Effect of impurities on microstructure; electropolishing and other metallographic techniques; Al alloys prepared from high-purity materials.

25D-37. Recent French Investigations in the Field of Light Alloys. Georges Chaudron. *Journal of the Institute of Metals,* v. 76, Sept. 1949, p. 1-16.

See abstract of condensed version from *Engineering,* item 25D-36, 1949.

25D-38. La préparation du glucinium et de ses composés. (Production of Beryllium and Its Compounds.) J. Besson. *Bulletin de la Société Chimique de France,* Jan.-Feb. 1949, p. D15-D22.

Production, properties, and applications. 48 ref.

25D-39. Wrought Magnesium Alloys; Typical Properties. *Materials & Methods,* v. 30, Nov. 1949, p. 75.

Table gives compositions; physical, mechanical, and fabricating properties; corrosion resistance; thermal treatment; available forms; and applications.

25D-40. Magnesium's Position in the Metal Field. J. W. Meier. *Modern Metals,* v. 5, Nov. 1949, p. 16-18.

Comparative tables showing world production, prices, and physical properties of "basic" metals. Includes graphs of mechanical properties of some wrought and sand-cast alloys.

25D-41. Availability of Magnesium. *Magazine of Magnesium,* Nov. 1949, p. 2-5.

Economic survey.

25D-42. The Canadian Aluminum Industry. P. E. Radley. *Canadian Chem-*

istry and Process Industries, v. 33, Nov. 1949, p. 952-955.

Brief over-all description.

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ADDRESSES OF PUBLICATIONS

I. English Language Journals

A

Acta Chemica Scandinavica (mostly English), Einar Munksgaard, Norregade 6, Copenhagen, Denmark.

Acta Crystallographica (mostly English), Cambridge University Press, Bentley House, Euston Rd., London N.W. 1, England; or American Institute of Physics, 57 East 55th St., New York 22, N. Y.

Aero Digest, Aeronautical Digest Publishing Corp., 515 Madison Ave., New York 22, N. Y.

Aeronautical Engineering Review, Institute of Aeronautical Sciences, 2 East 64th St., New York 21, N. Y.

Aeronautical Quarterly, 4 Hamilton Place, London W. 1, England.

Agricultural and Mechanical College of Texas, Bulletin, Engineering Experiment Station, College Station, Tex.

Aircraft Engineering, Bunhill Publications, Ltd., 12 Bloomsbury Square, London, W.C. 1, England.

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Alloy Casting Bulletin, 39 Broadway, New York, N. Y.

Alloy Metals Review, High Speed Steel Alloys, Ltd., Ditton Road, Widnes, Lancashire, England.

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American Chemical Society, Journal, 1155 Sixteenth St., N.W., Washington 6, D. C.

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American Ink Maker, MacNair-Dorland Co., Inc., 254 West 31st St., New York 1, N. Y.

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American Machinist, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

American Mineralogist, Mineralogical Society of America, Dr. Earl Ingerson, U. S. Geological Survey, Washington 25, D. C.

American Paint Journal, 3713 Washington Ave., St. Louis 8, Mo.

American Paper Converter, Howard Publishing Co., 111 W. Washington St., Chicago 2, Ill.

American Railway Engineering Association, Bulletin, 59 E. Van Buren St., Chicago 5, Ill.

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American Rocket Society, Journal, Engineering Bldg., 29 West 39th St., New York 18, N. Y.

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American Society of Naval Engineers, Journal, Bureau of Ships, U. S. Navy Dept., Washington, D. C.

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American Society for Testing Materials, Proceedings, 1916 Race St., Philadelphia 3, Pa.

American Waterworks Association, Journal, 500 Fifth Ave., New York 18, N. Y.

American Zinc Institute, Journal, 60 East 42nd St., New York 17, N. Y.

Analyst, W. Heffer & Sons, Ltd., Cambridge, England.

Analytical Chemistry, American Chemical Society, 1155 Sixteenth St., N. W., Washington 6, D. C.

Applied Hydraulics, Hydraulics Publishing Co., 1240 Ontario St., Cleveland 13, Ohio.

Applied Scientific Research, The Hague, Netherlands.

Architectural Forum, 540 North Michigan Ave., Chicago 11, Ill.

ASTM Bulletin, American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.

Australian Journal of Scientific Research, Council for Scientific and Industrial Research, Commonwealth of Australia, Melbourne, Victoria, Australia.

Automobile Engineer, Iliffe & Sons, Ltd., Dorset House, Stamford St., London S.E. 1, England.

Automotive Industries, Chestnut and 56th St., Philadelphia 39, Pa.

Aviation Week, 330 West 42nd St., New York 18, N. Y.

B

Bakelite Review, Bakelite Corp., 30 East 42nd St., New York 17, N. Y.

Baldwin, Baldwin Locomotive Works, Philadelphia 42, Pa.

Bearing Engineer, 295 Madison Ave., New York 17, N. Y.

Better Enameling, Chicago Vitreous Enamel Product Co., 1427 So. 55th Court, Cicero 50, Ill.

Birmingham Metallurgical Society, Journal, 253 Longbridge Lane, Northfield, Birmingham 31, England.

Blast Furnace and Steel Plant, Steel Publications, Inc., 108 Smithfield St., Pittsburgh 30, Pa.

British Cast Iron Research Association Journal of Research and Development, Alvechurch, Birmingham, England.

British Ceramic Society, Transactions, The North Staffordshire Technical College, Stoke-on-Trent, England.

British Chemical Digest, Discontinued and incorporated with Engineering and Chemical Digest, 307 P.F.A.C. Gebou, 15 DeVilliers St., Johannesburg, South Africa.

British Coal Utilization Research Association, Monthly Bulletin, 13 Grosvenor Gardens, London S.W. 1, England.

British Plastics, Iliffe & Sons, Ltd., Dorset House, Stamford St., London S.E. 1, England.

B.S.F.A. Bulletin, British Steel Founders Assn., 301 Glossop Rd., Sheffield 10, England.

British Steelmaker, 7 Chesterfield Gardens, Curzon St., London W. 1, England.

Brown Boveri Review, Brown, Boveri & Co., Ltd., Baden, Switzerland.

Bulletin of the Agricultural and Mechanical College of Texas, Engineering Experiment Station, College Station, Tex.

Bulletin of the Institution of Mining and Metallurgy, Salisbury House, Finsbury Circus, London E.C. 2, England.

C

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Canadian Chemistry and Process Industries, 137 Wellington St., West, Toronto, Ont., Canada.

Canadian Institute of Mining and Metallurgy, Transactions (See Canadian Mining and Metallurgical Bulletin).

Canadian Journal of Research, National Research Council of Canada, Ottawa, Ont., Canada.

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Canadian Mining Journal, National Business Publications, Ltd., Gardenvale, Quebec, Canada.

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Ceramic Age, Ceramics Publishing Co., 421 Parker St., Newark 4, N. J.

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Chemical Age, Bouverie House, 154 Fleet St., London E.C. 4, England.

Chemical Engineering, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.
Chemical and Engineering News, 1155 Sixteenth St., N. W., Washington, D. C.
Chemical Engineering Progress, American Institute of Chemical Engineers, 120 East 41st St., New York 17, N. Y.
Chemical Industries, 1309 Noble St., Philadelphia 23, Pa.
Chemical, Metallurgical, and Mining Society of South Africa, Journal, Kelvin House, Marshall and Hollard Sts., Johannesburg, South Africa.
Chemical Society, Journal, Burlington House, London W. 1, England.
Chemist Analyst, J. T. Baker Chemical Co., Phillipsburg, N. J.
Chemistry & Industry, 56 Victoria St., London S.W. 1, England.
Coal Age, 210 S. Desplaines St., Chicago 6, Ill.
Coke and Gas, Transport, Ltd., 33 Tothill St., Westminster, London S.W. 1, England.
Colliery Guardian, 30-31 Furnival St., Holborn, London E.C. 4, England.
Combustion, Combustion Publishing Co., 200 Madison Ave., New York 16, N. Y.
Communications, Bryan Davis Publishing Co., 52 Vanderbilt Ave., New York 17, N. Y.
Compressed Air Magazine, Phillipsburg, N. J.
Copper and Brass Bulletin, 420 Lexington Ave., New York 17, N. Y.
Corrosion, National Association of Corrosion Engineers, 919 Milam Bldg., 803 Texas Ave., Houston 2, Tex.
Council for Scientific and Industrial Research, Journal, Commonwealth of Australia, Melbourne, Victoria, Australia.
Current Digest of the Soviet Press, Joint Committee on Slavic Studies, 1745 S. State St., Ann Arbor, Mich.

D

Deco Trefoil, Denver Equipment Co., 1400 Seventeenth St., Denver 17, Colo.
Die Castings, Technical Publishing Co., 1240 Ontario St., Cleveland 13, Ohio.
Discovery, Jarrold & Sons, Ltd., Norwich, England.
Discussions of the Faraday Society, 6 Gray's Inn Square, London W.C. 1, England; or Aberdeen University Press, Ltd., 6 Upper Kirkgate, Aberdeen, Scotland.
Drilling, Associated Publishers, Inc., 1420 Pacific Ave., Dallas, Tex.
DuPont Magazine, E. I. DuPont De Nemours & Co., Inc., Wilmington, Del.

E

Economic Geology and the Bulletin of the Society of Economic Geologists, Economic Geology Publishing Co., M. M. Leighton, Business Manager, Urbana, Ill.
Edgar Allen News, Edgar Allen & Co., Ltd., Imperial Steel Works, Sheffield 9, England.
Edison Electric Institute Bulletin, 56th & Chestnut Sts., Philadelphia 39, Pa.
Electrical Communication, International Telephone and Telegraph Corp., 67 Broad St., New York 4, N. Y.
Electrical Engineering, American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y.
Electrical Manufacturing, 1250 Sixth Ave., New York 20, N. Y.
Electric Furnace Steel Proceedings, American Institute of Mining and Metallurgical Engineers, 29 West 39th St., New York 18, N. Y.
Electric Light and Power, Electrical Publications, Inc., 360 N. Michigan Ave., Chicago, Ill.
Electrochemical Society, Journal, 235 West 102nd St., New York 25, N. Y.
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Electrodepositors' Technical Society, Journal, 27 Islington, London, N. 1., England.
Electronic Engineering, 28 Essex St., Strand, London W.C. 2, England.
Electronics, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.
Electroplating and Metal Finishing, 83-85 Udney Park Rd., Teddington, Middlesex, England.
Enamelist, 4150 East 56th St., Cleveland 5, Ohio.
Engineer, 28 Essex St., Strand, London W.C. 2, England.
Engineering, 35-36 Bedford St., Strand, London W.C. 2, England.
Engineering and Chemical Digest, 307 P. F.A.C. Gebou, 15 de Villiers St., Johannesburg, South Africa.
Engineering Experiment Station News

(See Ohio State University, Engineering Experiment Station News).

Engineering and Mining Journal, 210 S. Desplaines St., Chicago 6, Ill.

Engineering News-Record, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

Engineers' Digest, Robert Stockwell, Ltd., 5-7 Baden Place, London S.E. 1, England.

Escher Wyss News, Escher Wyss Engineering Works, Ltd., Zurich, Switzerland.

Esso Oilways, Standard Oil Co. of New Jersey, 15 West 51st St., New York 19, N. Y.

F

Factory Management and Maintenance, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

Faraday Society, Discussions, 6 Gray's Inn Square, London W.C. 1, England; or Aberdeen Univ. Press, Ltd., 6 Upper Kirkgate, Aberdeen, Scotland.

Faraday Society, Transactions, 6 Gray's Inn Square, London W.C. 1, England; or Aberdeen Univ. Press, Ltd., 6 Upper Kirkgate, Aberdeen, Scotland.

Fasteners, Industrial Fasteners Institute, 3648 Euclid Ave., Cleveland 15, Ohio.

Finish, Dana Chase Publications, 360 North Michigan Ave., Chicago 1, Ill.

Food Industries, McGraw-Hill Publishing Co., 330 West 42nd St., New York 18, N. Y.

Foote Prints, 18 W. Chilton Ave., Philadelphia 44, Pa.

Fortune, 540 N. Michigan Ave., Chicago 11, Ill.

Foundry, Penton Publishing Co., Penton Bldg., Cleveland 13, Ohio.

Foundry Trade Journal, 49 Wellington St., Strand, London W.C. 2, England.

Franklin Institute, Journal, Prince and Lemon Sts., Lancaster, Pa.

G

Gas Journal, 11 Bolt Court, Fleet St., London E.C. 4, England.

Gas Times, 29 Grove Rd., Leighton Buzzard, Beds., England.

General Electric Review, General Electric Co., 1 River Road, Schenectady 5, N. Y.

Glass Digest, Ashlee Publishing Co., 225 Lafayette St., New York 12, N. Y.

H

Heating, Piping & Air Conditioning, Keeney Publishing Co., 6 N. Michigan Ave., Chicago 2, Ill.

Heating and Ventilating, The Industrial Press, 148 Lafayette St., New York 13.

I

Inco Magazine, International Nickel Co., 67 Wall St., New York 5, N. Y.

Indian Academy of Sciences, Proceedings, Bangalore, India.

India Rubber Journal, Stafford House, Norfolk St., Strand, London W.C. 2, England.

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Industrial Chemist and Chemical Manufacturing, 33 Tothill St., Westminster, London S.W. 1, England.

Industrial Diamond Review, N.A.G. Press, Ltd., 226 Latymer Court, Hammersmith, London W. 6, England (U. S. Agent: Henry Paulson & Co., 131 S. Wabash Ave., Chicago, Ill.)

Industrial and Engineering Chemistry, American Chemical Society, 1155 Sixteenth St., N.W., Washington 6, D. C.

Industrial Finishing, Practical Publications, Inc., 1142 N. Meridian St., Indianapolis 4, Ind.

Industrial Gas, Moore Publishing Co., 9 East 38th St., New York 16, N. Y.

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Industry and Welding, 1240 Ontario St., Cleveland 13, Ohio.

Institute of British Foundrymen, Proceedings, St. John St. Chambers, Deansgate, Manchester 3, England.

Institute of Fuel, Journal, 18 Devonshire St., London W. 1, England.

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Institute of Welding, Transactions, 2 Buckingham Palace Gardens, London S.W. 1, England.

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Institution of Mechanical Engineers, Proceedings, Storey's Gate, St. James Park, London S.W. 1, England.
Institution of Mining and Metallurgy, Bulletin, Salisbury House, Finsbury Circus, London E.C. 2, England.
Institution of the Rubber Industry, Transactions, 12 Whitehall, London S.W. 1, England.
Instrumentation, Wayne and Roberts Aves., Philadelphia 44, Pa.
Instruments, Instruments Publishing Co., 921 Ridge Ave., Pittsburgh 12, Pa.
IRI Transactions, 12 Whitehall, London S.W. 1, England.
Iron Age, Chilton Co., 100 E. 42nd St., New York 17, N. Y.
Iron and Steel, Louis Cassier Co., Ltd., Dorset House, Stamford St., London S.E. 1, England.
Iron and Steel Engineer, Association of Iron and Steel Engineers, 1010 Empire Bldg., Pittsburgh 22, Pa.
Iron and Steel Institute, Journal, 4 Grosvenor Gardens, London S.W. 1, England.

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Journal of the American Ceramic Society, 2525 N. High St., Columbus 2, Ohio.
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Journal of the American Dental Association, 222 East Superior St., Chicago 11, Ill.
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Journal, American Waterworks Association, 500 Fifth Ave., New York 18, N. Y.
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Journal, American Zinc Institute, 60 East 42nd St., New York 17, N. Y.
Journal of Applied Mechanics, American Society of Mechanical Engineers, 29 West 39th St., New York 18, N. Y.
Journal of Applied Physics, American Physical Society, 57 East 55th St., New York 22, N. Y.; or Prince and Lemon Sts., Lancaster, Pa.
Journal of the Birmingham Metallurgical Society, 253 Longbridge Lane, Northfield, Birmingham 31, England.
Journal of Chemical Education, 20th and Northampton Sts., Easton, Pa.
Journal of the Chemical, Metallurgical, and Mining Society of South Africa, Kelvin House, Marshall and Hollard Sts., Johannesburg, South Africa.
Journal of Chemical Physics, American Institute of Physics, 57 East 55th St., New York 22, N. Y.; or Prince and Lemon Sts., Lancaster, Pa.
Journal of the Chemical Society, Burlington House, London W. 1, England.
Journal of Colloid Science, Academic Press, Inc., 125 East 23rd St., New York 10, N. Y.
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Journal of the Electrochemical Society, 235 West 102nd St., New York 25, N. Y.
Journal of the Electrodepositors' Technical Society, 27 Islington, London N. 1, England.
Journal of the Franklin Institute, Prince and Lemon Streets, Lancaster, Pa.
Journal of the Imperial College Chemical Engineering Society, W. J. Fowler & Son, Ltd., Cricklewood Broadway, London N.W. 2, England.
Journal of the India Society of Engineers, 12 Netaji Subhas Road, Calcutta, India.
Journal of the Institute of Fuel, 18 Devonshire St., London W. 1, England.
Journal of the Institute of Metals, 4 Grosvenor Gardens, London S.W. 1, England.
Journal of the Institute of Petroleum, Manson House, 26 Portland Place, London W. 1, England.
Journal of the Iron and Steel Institute, 4 Grosvenor Gardens, London S.W. 1, England.
Journal of Metals, Metals Branch, American Institute of Mining and Metallurgi-

cal Engineers, 29 West 39th St., New York 18, N. Y.

Journal of the Optical Society of America, American Institute of Physics, 57 East 55th St., New York 22, N. Y.; or Prince and Lemon Sts., Lancaster, Pa.

Journal of Petroleum Technology, American Institute of Mining & Metallurgical Engineers, 29 West 39th St., New York 18, N. Y.

Journal of Physical and Colloid Chemistry, Williams & Wilkins Co., Mt. Royal and Guilford Aves., Baltimore 2, Md.

Journal of Research of the National Bureau of Standards, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Journal of Scientific and Industrial Research, "P" Block, Raisina Road, New Delhi, India.

Journal of Scientific Instruments and of Physics in Industry, Institute of Physics, 47 Belgrave Square, London S.W. 1, England.

Journal of the Scientific Research Institute, 31 Kamifujimae-Cho Komagoine, Bunkyo-ku, Tokyo, Japan. (U.S. Agent: J. S. Canner & Co., 909 Boylston St., Boston 15, Mass.).

Journal of the Society of Chemical Industry, 56 Victoria St., London S.W. 1, England.

Journal of the Society of Glass Technology, "Elmfield," Northumberland Rd., Sheffield 10, England.

Journal of the Society of Public Analysts and Other Analytical Chemists (See Analyst).

Journal of Southern Research, 5009 Peachtree Rd., N.E., Atlanta, Ga.

Journal of the West of Scotland Iron and Steel Institute, 39 Elmbank Crescent, Glasgow, Scotland.

L

Light Metal Age, 220 South State St., Chicago 4, Ill.

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Lubrication Engineering, American Society of Lubrication Engineers, 343 S. Dearborn St., Chicago 4, Ill.

Lukens Plate, Lukens Steel Co., 430 Lukens Bldg., Coatesville, Pa.

M

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Machine and Tool Blue Book, Hitchcock Publishing Co., 222 East Willow Ave., Wheaton, Ill.

Machinery (American), The Industrial Press, 148 Lafayette St., New York 13, N. Y.

Machinery (London), Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England.

Machinery Lloyd (Overseas Edition), 6 Cavendish Place, Regent St., London W. 1, England.

Magazine of Magnesium, Brooks & Perkins, Inc., 2457 Woodward Ave., Detroit 1, Mich.

Magnesium Review and Abstracts, Magnesium Elektron, Ltd., Abbey House, London N.W. 1, England.

Mainspring, Associated Spring Corp., Bristol, Conn.

Master Boiler Makers' Association, Official Proceedings, 29 Parkwood Ave., Albany, N. Y.

Materials & Methods, Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y.

Mechanical Engineering, American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.

Mechanical Handling, Louis Cassier Co., Ltd., Dorset House, Stamford St., London S.E. 1, England.

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Mechanization, Munsey Bldg., Washington 4, D. C.

Metal Finishing, 11 W. 42nd St., New York 18, N. Y.

Metal Industry, Louis Cassier Co., Ltd., Dorset House, Stamford St., London S. E. 1, England.

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Metal Progress, American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.

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Metallurgia, Kennedy Press, Ltd., 31 King St., West, Manchester 3, England.

Metals, Atlas Publishing Co., 425 W. 25th St., New York 1, N. Y.

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Mine & Quarry Engineering, 23 Great Queen St., London W.C. 2, England.

Mineral Industries, Pennsylvania State College, State College, Pa.

Mines Magazine, Colorado School of Mines Alumni Association, 734 Cooper Bldg., Denver 2, Colo.

Mining Congress Journal, 1102 Ring Bldg., Washington 2, D. C.

Mining Engineering, American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, N. Y.

Mining Magazine, Mining Publications, Ltd., Salisbury House, London E.C. 2, England.

Mining and Metallurgical Society of America, Bulletin, 11 Broadway, New York 4, N. Y.

Mining World, 121 Second St., San Francisco 5, Calif.

Modern Industrial Press, Andresen, Inc., Windsor Manor, P. O. Box 687, Pittsburgh 30, Pa.

Modern Industry, Magazines of Industry, Inc., 347 Madison Ave., New York 17, N. Y.

Modern Lithography, 254 West 31st St., New York 1, N. Y.

Modern Machine Shop, 431 Main St., Cincinnati 2, Ohio.

Modern Metals, Modern Metals Publishing Co., 206 S. Michigan Ave., Chicago 4, Ill.

Modern Packaging, 122 E. 42nd St., New York 17, N. Y.

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Murex Review, Murex, Ltd., Rainham, Essex, England.

N

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National Bureau of Standards, Technical News Bulletin, Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

Nature, Macmillan and Co., Ltd., St. Martin's St., London W.C. 2, England.

Nickel Bulletin, Mond Nickel Co., Ltd., Sunderland House, Curzon St., London W. 1, England.

Non-Destructive Testing, Society for Non-Destructive Testing, Skokie, Ill.

Nucleonics, McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.

O

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Optical Society of America, Journal, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.; or Prince and Lemon Sts., Lancaster, Pa.

Organic Finishing, Finishing Publications, Inc., 11 W. 42nd St., New York 18, N.Y.

P

Paint Manufacture, Leonard Hill, Ltd., 17 Stratford Place, London W. 1, England.

Paint, Oil and Chemical Review, Trade Review Co., 537 S. Dearborn St., Chicago 5, Ill.

Paint Progress, New Jersey Zinc Co., 160 Front St., New York 7, N. Y.

Paint and Varnish Production Manager, Powell Magazines, Inc., 855 Avenue of the Americas, New York 1, N. Y.

Paper Mill News, L. D. Post, Inc., 1309 Noble St., Philadelphia 23, Pa.

Paper Trade Journal, Lockwood Trade Journal Co., Inc., 15 W. 47th St., New York 19, N. Y.

Petroleum Engineer, Petroleum Engineer Publishing Co., Irwin-Keasler Bldg., Dallas 1, Tex.

Petroleum Processing, National Petroleum Publishing Co., 1213 West 3rd St., Cleveland 13, Ohio.

Petroleum Refiner, Gulf Publishing Co., Box 2608, Houston 1, Tex.

Philips Research Reports, 215 Fourth Ave., New York 3, New York.
Philips Technical Review, N. V. Philips' Gloeilempenfabrieken, Technical and Scientific Literature Dept., Eindhoven, The Netherlands.
Philosophical Magazine, Taylor and Francis Ltd., Red Lion Court, Fleet St., London E.C. 4, England.
Photo-Engravers' Bulletin, 166 W. Van Buren St., Chicago 4, Ill.
Physica (mostly English), Martinus Nijhoff, The Hague, Netherlands.
Physical Review, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.; or Prince and Lemon Sts., Lancaster, Pa.
Physical Society, Proceedings, 1 Lowther Gardens, Prince Consort Rd., London S.W. 7, England.
Physics Today, American Institute of Physics, 57 E. 55th St., New York, N.Y.
Pig Iron Rough Notes, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala.
Pipe Line News, Oildom Publishing Co., 101 W. Alabama, Houston 6, Tex.
Plastic Institute Transactions, The Adelphi, Adam St., London W.C. 2, England.
Plastics (American), Vincent Edwards & Co., 342 Madison Ave., New York, N.Y.
Plastics (London), Temple Press Ltd., Bowling Green Lane, London E.C. 1, England.
Plating, American Electroplaters' Society, 473 York Rd., Jenkintown, Pa.
Powder Metallurgy Bulletin, 320 Yonkers Ave., Yonkers 2, N. Y.
Power, 418 W. 25th St., New York 1, N.Y.
Power Generation, Technical Publishing Co., 53 W. Jackson Blvd., Chicago 4, Ill.
Printing Equipment Engineer, 1276 W. Third St., Cleveland 13, Ohio.
Proceedings, American Electroplaters Society, Box 168, Jenkintown, Pa.
Proceedings, American Railway Engineering Association, 59 E. Van Buren, Chicago 5, Ill.
Proceedings, Blast Furnace, Coke Oven and Raw Materials Committee, Iron and Steel Division, American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 15, N. Y.
Proceedings of the Chemical Engineering Group, Society of Chemical Industry, 56 Victoria St., London S.W. 1, England.
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Proceedings, Metal Powder Association, 420 Lexington Ave., New York 17, N. Y.
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Proceedings of the Physical Society, 1 Lowther Gardens, Prince Consort Rd., London S.W. 7, England.
Proceedings of the Royal Society, Cambridge University Press, Bentley House, London N.W. 1, England.
Proceedings of the Smoke Prevention Association of America, 139 N. Clark St., Chicago, Ill.
Proceedings of the Society for Experimental Stress Analysis, Central Square Station, P. O. Box 168, Cambridge 39, Mass.
Product Engineering, McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.
Production Engineering & Management, Bramson Publishing Co., 2842 West Grand Blvd., Detroit 2, Mich.
Products Finishing, Gardner Publications, Inc., 431 Main St., Cincinnati 2, Ohio.
Progressive Architecture, Reinhold Publishing Corp., 330 West 42nd St., New York 18, N. Y.

Q

Quarterly of Applied Mathematics, Brown University, Providence 12, R. I.; or Box 2-W, Richmond 5, Va.
Quarterly of the Colorado School of Mines, Golden, Colo.
Quarterly Journal of Mechanics and Applied Mathematics, Oxford University Press, Amen House, London E.C. 4, England.
Quarterly Reviews, The Chemical Society, London, England.

R

Radio-Electronic Engineering (Bound with Radio & Television News), 185 N. Wabash Avenue, Chicago 1, Ill.
Railway Age, 30 Church St., New York 7, N. Y.
Railway Engineering and Maintenance, 30 Church St., New York 7, N. Y.
Railway Mechanical Engineer, 30 Church St., New York 7, N. Y.
Refractories Journal, 7 Chesterfield Gardens, Curzon St., London W. 1, England.
Refrigerating Engineering, American Society of Refrigerating Engineers, 40 West 40th St., New York 18, N. Y.
Reports on Progress in Physics, 1 Lowther Gardens, Prince Consort Rd., London S.W. 7, England.
Research, Butterworths Scientific Publications, Ltd., 4-6 Bell Yard, Temple Bar, London W.C. 2, England.
Research Engineer, Georgia Institute of Technology, Atlanta, Ga.
Review of Scientific Instruments, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.; or Prince and Lemon Streets, Lancaster, Pa.
Reviews of Modern Physics, American Institute of Physics, 57 E. 55th St., New York 22, N. Y.; or Prince and Lemon Streets, Lancaster, Pa.
Reynolds Metals Technical Advisor, 2500 South Third Street, Louisville 1, Ky.
Rock Products, MacLean-Hunter Publishing Corp., 309 W. Jackson Blvd., Chicago 6, Ill.
Royal Society, Proceedings, Cambridge University Press, Bentley House, London N.W. 1, England.
Rubber Age, Palmerton Publishing Co., 250 W. 57th St., New York 19, N. Y.

S

S A E Journal, Society of Automotive Engineers, 29 W. 39th St., New York 18, N. Y.
S A E Quarterly Transactions, Society of Automotive Engineers, 29 W. 39th St., New York 18, N. Y.
Science, 1515 Massachusetts Ave., N.W., Washington 5, D. C.
Science & Engineering, (Previously Journal of the India Society of Engineers), India Society of Engineers, 12 Netaji Subhas Road, Calcutta 1, India.
Science News Letter, Science Service Inc., 1719 N St., N.W., Washington 6, D. C.
Science Progress, 41 Maddox St., London W. 1, England.
Science & Technology in China, U. S. Agent: S. H. Doo, 117 S. Chestnut St., Derry, Pa.
Scientific American, 24 W. 40th St., New York 18, N. Y.
Scientific Apparatus and Methods, E. H. Sargent and Co., 4647 W. Foster Ave., Chicago 30, Ill.
Scientific Monthly, 1515 Massachusetts Ave., N.W., Washington 5, D.C.
Scientific Research Institute, Journal, 31 Kamifujimae-Cho, Komagoine, Bunkyo-ku, Tokyo, Japan, (U. S. Agent: J. S. Canner and Co., 909 Boylston Street, Boston 15, Mass.
Screw Machine Engineering, Screw Machine Publishing Co., 45 Exchange St., Rochester 14, N. Y.
Sheet Metal Industries, 49 Wellington St., London W.C. 2, England.
Sheet Metal Worker, Edwin A. Scott Publishing Co., 23 W. 47th St., New York 19, N. Y.
Skillings' Mining Review, David N. Skillings, 810 Fidelity Bldg., Duluth 2, Minn.
Smoke Prevention Association of America, Proceedings, 139 N. Clark St., Chicago, Ill.
Society of Automotive Engineers, Journal (See S A E Journal).
Society of Automotive Engineers, Quarterly Transactions (See S A E Quarterly Transactions).
Society of Chemical Industry, Journal, 56 Victoria St., London S.W. 1, England.
Society for Experimental Stress Analysis, Proceedings, Central Square Station, P. O. Box 168, Cambridge 39, Mass.
Society of Glass Technology, Journal, "Elmfield," Northumberland Road, Sheffield 10, England.
Society of Public Analysts and Other Analytical Chemists, Journal (also Transactions) (See Analyst).
Spectrochimica Acta, Springer Verlag, Berlin, Germany. (U. S. Agent: Dr. Lester W. Strock, N. Y. State Research Institute, Saratoga Springs, N. Y.).
Standards World, Box 7593, Benjamin Franklin Station, Washington 4, D. C.
Steel, Penton Building, 1213 West Third St., Cleveland 13, Ohio.

Steel Horizons, Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Steel Processing, 108 Smithfield St., Pittsburgh 30, Pa.
Steelways, American Iron and Steel Institute, 350 Fifth Avenue, New York 1, N. Y.

T

Technical Association Papers (TAPPI) Lockwood Trade Journal Co., Inc., 15 W. 47th St., New York 19, N. Y.
Technical Data Digest, Central Air Documents Office, Wright-Patterson Air Force Base, Dayton, Ohio.
Technical News Bulletin (See National Bureau of Standards, Technical News Bulletin).
Testing Topics, Baldwin Locomotive Works, Philadelphia 42, Pa.
Tool & Die Journal, 1975 Lee Road, Cleveland 18, Ohio.
Tool Engineer, 550 W. Lafayette Blvd., Detroit 26, Mich.
Transactions of the American Foundrymen's Association (See Transactions of American Foundrymen's Society).
Transactions of the American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.
Transactions of the American Institute of Mining and Metallurgical Engineers, 29 W. 39th St., New York 18, N. Y.
Transactions of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, N. Y.
Transactions of the American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.
Transactions of the British Ceramic Society, North Staffordshire Technical College, Stoke-on-Trent, England.
Transactions of the Canadian Institute of Mining and Metallurgy (See Canadian Mining and Metallurgical Bulletin).
Transactions of the Electrochemical Society, 235 W. 102nd St., New York 25.
Transactions of the Faraday Society, 6 Gray's Inn Square, London W.C. 1, England; or Aberdeen University Press, Ltd., 6 Upper Kirkgate, Aberdeen, Scotland.
Transactions of Institute of Welding, 2 Buckingham Palace Gardens, London S.W. 1, England.
Transactions of the Institution of Engineers and Shipbuilders in Scotland, Elmbank Crescent, Glasgow C. 2, Scotland.
Transactions of the Institution of the Rubber Industry, 12 Whitehall, London S.W. 1, England.
Transactions, Instruments and Measurements Conference, Norköpings Tidningars Aktiebolag, Norköpings, Sweden.
Transactions of the New York Academy of Sciences, Mt. Royal and Guilford Avenues, Baltimore 2, Md.
Transactions of the Royal Institute of Technology, Stockholm 26, Sweden.
Transactions of the Society of Public Analysts and Other Analytical Chemists (See Analyst).

U

United Effort, United Engineering & Foundry Co., First National Bank Bldg., Pittsburgh, Pa.
University of Illinois, Bulletin, Urbana, Ill.

V

Vancoram Review, 420 Lexington Ave., New York 17, N. Y.
Victor Weld (Formerly Weld), 850 Folsom St., San Francisco 7, Calif.

W

Welder, Murex Welding Processes, Ltd., Waltham Cross, Herts, England.
Welding, Louis Cassier, Ltd., Dorset House, Stamford St., London S.E. 1, England.
Welding Engineer, 210 S. DesPlaines St., Chicago 6, Ill.
Welding Journal, American Welding Society, 33 W. 39th St., New York 18, N.Y.
Welding Research (Bound with Institute of Welding, Transactions) (See latter for address.) Also available from British Welding Research Association, 29 Park Crescent, London W. 1, England.
West of Scotland Iron and Steel Institute, Journal, 39 Elmbank Crescent, Glasgow, Scotland.
Western Machinery and Steel World, 580 Market St., San Francisco 4, Calif.
Western Metals, 198 S. Alvarado St., Los Angeles 4, Calif.
Western Miner, Gordon Black Publications, Ltd., 505 Metropolitan Bldg., Vancouver, B. C., Canada.
Westinghouse Engineer, Westinghouse Electric Corp., 306 Fourth Ave., P. O. Box 1017, Pittsburgh 30, Pa.

Wire and Wire Products, The Wire Association, 300 Main St., Stamford, Conn.
What's New in Crops and Soils, American Society of Agronomy, 2702 Monroe St., Madison 5, Wis.
Wire Industry, 33 Furnival St., London E.C. 4, England.
World Oil, Gulf Publishing Co., 3301 Buffalo Drive, Houston 6, Tex.

Y

Yearbook of the American Iron and Steel Institute, 350 Fifth Ave., New York 1.

II. Foreign Language Periodicals

Most of the foreign journals (except Russian) are available through Stechert-Hafner, Inc., 31 East 10th St., New York 3, N. Y. The Russian journals are available through Four Continent Book Corp., 38 West 58th St., New York 16, N. Y.

A

Academie des Sciences, Comptes Rendus Hebdomadaires des Seances (See Comptes Rendus /France/).
Academy of Sciences of the USSR, Bulletin, Physical Series (See Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya).
Academy of Sciences of the USSR, Bulletin, Section of Chemical Sciences (See Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk).
Academy of Sciences of the USSR, Bulletin, Section of Technical Sciences (See Izvestiya Akademii Nauk SSSR, Otdelenie Tekhnicheskikh Nauk).
Academy of Sciences of the USSR, Reports (See Doklady Akademii Nauk SSSR).
Academy of Sciences of the USSR, News (See Vestnik Akademii Nauk SSSR).
Acta Chemica Scandinavica (English, French, or German), Einar Munksgaard, Norregade 6, Copenhagen, Denmark.
Acta Crystallographica (English, French, or German), American Institute of Physics, 57 East 55th St., New York 22, N. Y., or Cambridge University Press, Bentley House, Euston Road, London N.W. 1, England.
Acta Physica Austriaca (English, French, or German), Springer Verlag, 5 Molkerbastei, Vienna, Austria.
Alluminio (Italian), Istituto Sperimentale dei Metalli Leggeri, Via della Posta 8/10, Milan, Italy.
Analytica Chimica Acta (English, French, or German), Elsevier Publishing Co., 215 4th Ave., New York, N. Y.
Angewandte Chemie (German), Verlag Chemie, G.m.b.h., Hauptstrasse 127, Weinheim/Bergstrasse 17a, Germany.
Annalen der Physik (German), Johann Ambrosius Barth Verlag, Leipzig, Germany.
Annales de Chimie (French), Maisson et Cie., 120 Blvd. St. Germain, Paris 6, France.
Archiv für das Eisenhüttenwesen (German), Verlag Stahleisen M.b.h., Düsseldorf, Germany.
Archiv für Metallkunde (German), Verlag Chemie, G.m.b.H., Weinheim/Bergstrasse and Berlin, Germany.
Archiv für Technisches Messen (German) Leibniz Verlag, Schliessfach 31, Munich, Germany.
Associacão Brasiliera de Metais, Boletim (Portugese), Associacão Brasiliera de Metais, Sao Paulo, Brazil.
Avtogennoe Delo (Russian), Spartakovskaya 2a, Glavkislorod 3, Moscow, U.S.S.R.

B

Boiler and Turbine Construction (See Kotloturbostroenie).
Boiler and Trubine Manufacture (See Kotloturbostroenie).
Boletim da Associacao Brasiliera de Metais (See Associacao Brasiliera de Metais, Boletim).
Bulletin of the Academy of Sciences of the USSR, Physical Series (See Izvestiya Akademii Nauk, SSSR, Seriya Fizicheskaya).
Bulletin of the Academy of Sciences of the USSR, Section of Chemical Sciences (See Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk).
Bulletin of the Academy of Sciences of the USSR, Section of Technical Sciences (See Izvestiya Akademii Nauk SSSR, Otdelenie Teknicheskikh Nauk).
Bulletin de la Société Chimique de France (See Société Chimique de France, Bulletin).

C

Centraal Instituut voor Materiaal Onderzoek Afdeling Metalen (Dutch), Nijverheidsorganisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Netherlands.

Centre de Documentation Siderurgique, Circulaire d'Informations Techniques (French), 12 Rue de Madrid, Paris 8, France.

Chemie - Ingenieur - Technik (formerly Angewandte Chemie, Sec. B) (German), Verlag Chemie G.m.b.H., Weinheim/Bergstrasse, Germany.

Chemische Technik (German), Verlag Technik G.m.b.H., Dorotheenstrasse 41, Berlin N.W. 7, Germany.

Chimia (French, German, or Italian), Rascher-Verlag, Zurich, Switzerland.

Circulaire d'Informations Techniques (French), 12 Rue de Madrid, Paris 8, French.

Collection of Czechoslovak Chemical Communications (English or French), Czechoslovak Chemical Society, Prague, Czechoslovakia.

Comptes Rendus /France/ (French), 55 Quai des Grands-Augustins, Paris, France.

D

Die Neue Giesserei (German), 1 August Thyssen Strasse, Düsseldorf, Germany.

Doklady Akademii Nauk SSSR (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

F

Factory Laboratory (See Zavodskaya Laboratoriya).

Finish /Sweden/ (Swedish), Tekniska Förlags AB, Stockholm, Sweden.

Fonderie (French), L'Association Technique de Fonderie, 46 Victor-Hugo Ave., Paris 16, France.

Frequenz (German), Fachverlag Schiele and Schön, Leuschnerdamm 13, Berlin S.O. 36, Germany.

Fresenius' Zeitschrift für Analytische Chemie (German), Springer-Verlag, Jebensstrasse 1, Berlin—Charlottenburg, Germany.

G

Gas- und Wasserfach (German), Leibniz Verlag, Schliessfach 31, Munich 1, Germany.

H

Helvetica Chimica Acta (French, German, or Italian), Verlag Birkhauser A.G., Basel, Switzerland.

Helvetica Physica Acta (French, German, or Italian), Verlag Birkhauser A.G., Basel, Switzerland.

Hutnické Listy (Czech), Mucednicka 8, Brno-Zabovresky, Czechoslovakia.

I

Industrial Power (See Promyshlennaya Energetika).

L'Institut de Recherches de la Sidérurgie (French), 12 Rue de Madrid, Paris 8, France.

Izvestiya Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

Izvestiya Akademii Nauk, Otdelenie Tekhnicheskikh Nauk (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

Izvestiya Akademii Nauk, Seriya Fizicheskaya (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

J

Japan Institute of Metals, Journal (See Nippon Kinzoku Gakkai-Si).

Jernkontorets Annaler (Swedish), Kungsträdgardsgatan 6, Stockholm C, Sweden.

Journal of Analytical Chemistry (See Zhurnal Analiticheskoi Khimii).

Journal of Applied Chemistry (See Zhurnal Prikladnoi Khimii).

Journal de Chimie Physique et de Physico-Chimie Biologique (French), Societe de Chimie Physique, Ecole Nationale Supérieure de Chimie, 11 Rue Pierre Curie, Paris, France.

Journal of Experimental and Theoretical Physics (See Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki).

Journal du Four Électrique et des Industries Électrochimiques (French), 86 Rue Cardinet, Paris 17, France.

Journal of General Chemistry (See Zhurnal Obshchei Khimii).

Journal of the Japan Institute of Metals (See Nippon Kinzoku Gakkai-Si).

Journal of Physical Chemistry (See Zhurnal Fizicheskoi Khimii).

Journal des Recherches du Centre National de la Recherche Scientifique (French), 13 Quai Anatol France, Paris 7, France.

Journal de la Soudure (Zeitschrift für Schweisstechnik), (French and German), Stauffacherquai 36, Zurich 1, Switzerland.

Journal of Technical Physics (See Zhurnal Tekhnicheskoi Fiziki).

K

Kautschuk und Gummi (German), 48-49 Taubenstrasse, Berlin W. 8, Germany.

Kolloidnyi Zhurnal. (Russian), Academy of Sciences of the USSR, Volkhonka 14, Moscow, U.S.S.R.

Kolloid Zeitschrift (German), Verlag Dr. Dietrich Steinkopf, Einbaumstrasse 2, Frankfurt - am - Main - Greisheim, Germany.

Korrosion und Metallschutz (German), Verlag Chemie, G.m.b.H., Kurfürstenstrasse 51, Berlin W. 35, Germany.

Kotloturbostroenie (Russian), Leningrad 21, U.S.S.R.

L

La Metallurgia Italiana (Italian), Associazione Italiana di Metallurgia, 10 Via S. Paolo, Milan, Italy.

Lastijdschrift (See Review de la Soudure).

Le Vide (French) Société Française des Ingenieurs Techniciens du Vide, 44 Rue de Rennes, Paris 6, France.

M

Machine Tools and Equipment (See Stanki i Instrument).

Machine Tools and Instruments (See Stanki i Instrument).

Metalen (Dutch or English), Drukkerij-Uitgeverij "de Hofstad", 1-3 Scheepmakersstraat, 's-Gravenhage, Netherlands.

Metall (German), Metall-Verlag G.m.b.H., 38 Düsseldorfer Str., Berlin W15, Germany.

Metallforschung (German), Dr. Riederer-Verlag, 50 Marienstrasse, Stuttgart S, Germany.

Metalloberfläche (German), Verlag Carl Hauser, Munich 27, Germany.

Metallurgia Italiana (See La Metallurgia Italiana).

Métaux & Corrosion (French), Edition-Métaux, 32 rue du Marechal-Joffre, St.-Germain-en-Laye (Seine-at-Oise), France.

Mitteilungen des Chemischen Forschungsinstitutes der Industrie Österreichs (German), 16 Lothrinerstrasse, Vienna 3, Austria.

Monatshefte für Chemie und verwandte Teile anderer Wissenschaften (German), Springer Verlag, Molkerbastei 5, Vienna 1, Austria.

N

Neue Giesserei (See Die Neue Giesserei).

News of the Academy of Sciences of the USSR (See Vestnik Akademii Nauk SSSR).

Nippon Kinzoku Gakkai-si (Mainly Japanese; English Abstracts), Japan Institute of Metals, Sendai, Japan.

O

Ogneupory (Russian), Metallurgizdat, 30 Tsvetnoi Blvd., Moscow, U.S.S.R.

P

Physica (English, French, or German), Martinus Nijhoff, The Hague, Netherlands.

Physikalische Blatter (German), Verlag von Volk and Zeit, Karlsruhe, Germany.

Prace Badawcze Glownego Instytutu Metalurgii i Odlewnictwa (Polish), Instytut Metalurgii, 12-14 Ul. K. Miarki, Gliwice, Poland.

Progress in Chemistry (See Uspekhi Khimii).

Pro-Metal (French and German), Metallverband A.G., Berne, Switzerland.

Promyshlennaya Energetika (Russian), Gosenergoizdat, Shlyuzovaya Naberezhnaya 10, Moscow, U.S.S.R.

R

Recueil des Travaux Chimiques des Pays-Bas (English, French, or German), Nederlandse Chemische Vereniging, Lange Voorhout 5, 's-Gravenhage, Netherlands.

Refractories (See Ogneupory).

Reports of the Academy of Sciences of

the USSR (See Doklady Akademii Nauk SSSR).
Revue de l'Aluminium (French), 77 Blvd. Malesherbes, Paris 8, France.
Revue Générale du Caoutchouc (French), Société d'Editions Techniques Coloniales, 3 Square Petrarque, Paris 16, France.
Revue de Métallurgie (French), 5 Cite Pigalle, Paris 9, France.
Revue de la Soudure (French or Flemish), 21 Rue des Drapiers, Brussels, Belgium.

S

Schweissen und Schneiden (German), Friedrich Vieweg & Sohn, 1 Burgplatz, Braunschweig, Germany.
Schweisstechnik (German), 31 Schumanngasse, Vienna 18, Austria.
Schweizer Archiv für angewandte Wissenschaft und Technik (German or French), Buchdruckerei Vogt-Schild AG., Solothurn, Switzerland.
Smit Mededelingen, Willem Smit & Co.'s Transformatoren Fabriek N.V., Nijmegen, Netherlands.
Société Chimique de France, Bulletin (French), 28 Rue Saint-Dominique, Paris 7, France.
Soudure et Techniques Connexes (French), Publications de la Soudure Autogène, 39 Rue d'Amsterdam, Paris 8, France.
Spectrochimica Acta (English, French, German, or Italian), Springer Verlag, Berlin, Germany. (U. S. Agent: Dr. Lester W. Strock, N. Y. State Research Institute, Saratoga Springs, N. Y.
Stahl und Eisen (German), 1 August Thyssen Strasse, Düsseldorf, Germany.
Stanki i Instrument (Russian), "Mashgiz," Ministry of Heavy Machinery Manufacturing of the USSR, Kuibysheva 4, Moscow 12, U.S.S.R.

U

Uspekhi Khimii (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

V

Verres et Réfractaires (French), Société d'Editions Verrieres et Ceramiques, 34 Rue Michel-Ange, Paris 16, France.
Vestnik Akademii Nauk SSSR (Russian), The Academy of Sciences of the U.S.S.R., Moscow and Leningrad, U.S.S.R.
Vide (See Le Vide).
Von Roll Mitteilungen (German), Gesellschaft der Ludw. Von Roll'schen Eisenwerke AG, Gerlafingen, Switzerland.

W

Welding (See Avtogennoe Delo).

Z

Zavodskaya Laboratoriya (Russian), Government Bureau of the Metallurgical Industry, Moscow, U.S.S.R.
Zeitschrift für analytische Chemie, Fresenius' (German), Springer-Verlag, Jebenstrasse 1, Berlin-Charlottenberg, Germany.
Zeitschrift für angewandte Physik (German), Springer-Verlag, Jebenstrasse 1, Berlin-Charlottenberg, Germany.
Zeitschrift für anorganische Chemie (German), Johann Ambrosius Barth Verlag, Leipzig, Germany.
Zeitschrift für Elektrochemie und angewandte physikalische Chemie, Verlag Chemie G.m.b.H., Berlin, Germany.
Zeitschrift für Erzbergbau und Metallhüttenwesen (German), Dr. Riederer Verlag, 50 Marienstrasse, Stuttgart S, Germany.
Zeitschrift für Metallkunde (German), Dr. Riederer Verlag, 50 Marienstrasse, Stuttgart S, Germany.
Zeitschrift für Naturforschung (German), Johannesweg 11, Tübingen, Germany.
Zeitschrift für Physik (German), Springer Verlag, Berlin, Germany.
Zeitschrift für Schweisstechnik (Journal de la Soudure) (German and French), Stauffacherquai 36, Zurich 1, Switzerland.
Zeitschrift des Vereins Deutscher Ingenieure (German), Deutscher Ingenieur-Verlag G.m.b.H., Ingenieurhaus, 77 Prinz-Georg-Strasse, Düsseldorf, Germany.
Zhurnal Analiticheskoi Khimii (Russian), Academy of Sciences of the USSR, Moscow and Leningrad, U.S.S.R.
Zhurnal Eksperimental'noi i Teoreticheskoi Khimii (Russian), Academy of Sciences of the USSR, Moscow and Leningrad, U.S.S.R.
Zhurnal Fizicheskoi Khimii (Russian), Academy of Sciences of the USSR,

Moscow and Leningrad, U.S.S.R.
Zhurnal Obshchei Khimii (Russian), Academy of Sciences of the USSR, Moscow and Leningrad, U.S.S.R.
Zhurnal Prikladnoi Khimii (Russian), Academy of Sciences of the USSR, Moscow and Leningrad, U.S.S.R.
Zhurnal Tekhnicheskoi Fiziki (Russian), Academy of Sciences of the USSR, Moscow, U.S.S.R.

III. Miscellaneous Material

A

Aeronautical Research Institute of Sweden, Stockholm-Ulvsunda, Sweden.
Agricultural and Mechanical College of Texas, Engineering Experiment Station, College Station, Tex.
American Brake Shoe Co., 230 Park Ave., New York 17, N. Y.
American Foundrymen's Society, 616 S. Michigan Ave., Chicago 5, Ill.
American Gas Association, 420 Lexington Ave., New York 17, N. Y.
American Society for Metals, 7301 Euclid Ave., Cleveland 3, Ohio.
American Institute of Electrical Engineers, 33 West 39th St., New York 18.
American Iron and Steel Institute, 350 Fifth Ave., New York 1, N. Y.
American Society of Mechanical Engineers, 29 West 39th St., New York 18.
American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa.
American Welding Society, Automotive Welding Committee, 33 West 39th St., New York 18, N. Y.
Armour Research Foundation, Illinois Institute of Technology, 35 West 33rd St., Chicago 16, Ill.
Atomic Energy Commission, Documents Publication Section, Technical Information Branch, P. O. Box E, Oak Ridge, Tenn.

B

British Information Service, 30 Rockefeller Plaza, New York, N. Y.
British Nonferrous Metals Research Association, 81-91 Euston Street, London N.W. 1, England.
Bureau of Mines, Washington 25, D. C.
Butterworths Scientific Publications, 4-6 Bell Yard, Temple Bar, London W.C. 2, England.

C

Carnegie Library of Pittsburgh, 440 Forbes, Pittsburgh, Pa.
Council for Scientific and Industrial Research, Commonwealth of Australia, Melbourne, Victoria, Australia.

D

David W. Taylor Model Basin, U. S. Navy, Washington 25, D. C.
Department of Supply and Development, Commonwealth of Australia, Melbourne, Victoria, Australia.
Division of Aeronautics, Council for Scientific and Industrial Research, Commonwealth of Australia, Melbourne, Victoria, Australia.
Division of Tribophysics, Council for Scientific and Industrial Research, Commonwealth of Australia, Melbourne, Victoria, Australia.

E

Edward Orton, Jr., Ceramic Foundation, 1445 Summit St., Columbus, Ohio.
Electrodepositors Technical Society, Northampton St., London E.C. 1, England.
Engineering Experiment Station, Pennsylvania State College, State College, Pa.
Engineering Experiment Station, University of Illinois, Urbana, Ill.

H

H. M. Stationery Office, London, England.

I

Idaho Bureau of Mines and Geology, Moscow, Idaho.
Illinois Institute of Technology, 35 West 33rd St., Chicago 16, Ill.
Institute of British Foundrymen, 49 Wellington St., Strand, London W.C. 2, England.
Institute of Metals, 4 Grosvenor Gardens, London S.W. 1, England.
Institute of Physics, 47 Belgrave Square, London S.W. 1, England.
Institution of Mining and Metallurgy,

Finsbury Circus, London E.C. 2, England.

L'Institut de la Recherche de la Siderurgie, 12 Rue de Madrid, Paris 8, France.

International Nickel Co., 67 Wall Street, New York 5, N. Y.

Iron and Steel Institute, Library and Information Department, 4 Grosvenor Gardens, London S.W. 1, England.

J

Journées des Etats de Surface, L'Université de Paris, RGE, 12, Place de Laborde, Paris 8, France.

M

Munitions Supply Laboratories, Department of Munitions, Commonwealth of Australia, Maribyrnong, Victoria, Australia.

N

National Advisory Committee for Aeronautics, Washington 25, D. C.

National Association of Corrosion Engineers, 919 Milam Bldg., 803 Texas Ave., Houston 2, Tex.

National Bureau of Standards, Washington 25, D. C.

National Research Council of Canada, Ottawa, Ont., Canada.

Nederlands Institut voor Electrowarmte en Electrochemie (Transactions of 2nd International Conference on Electroheat and Electrochemistry), Arnheim, Netherlands.

O

Office of Military Government for Germany, Washington, D. C. (See also British Information Service).

Office of Technical Services, Department of Commerce, Washington 25, D. C.

Office of Naval Research, Library of Congress, Washington 25, D. C.

P

The Physical Society, 1 Lowther Gardens, Prince Consort Road, London S.W. 7, England.

Pittsburgh International Conference on Surface Reactions, Corrosion Publishing Co., 1131 Wolfendale St., Pittsburgh 12, Pa.

S

St. John X-ray Laboratory, Califon, N. J.

Society of Automotive Engineers, Inc., 29 West 39th St., New York 18, N. Y.

Specola Vaticana, Vatican City, Italy.

T

Tariff Commission, Washington, D. C.

U

University of Melbourne, Melbourne, Australia.

U. S. Atomic Energy Commission (See Atomic Energy Commission).

U. S. Bureau of Mines (See Bureau of Mines).

U. S. Government Printing Office, Washington 25, D. C.

U. S. Navy, David W. Taylor Model Basin, Washington, D. C.

U. S. Tariff Commission (See Tariff Commission).

W

West of Scotland Iron and Steel Institute, 39 Elmbank Crescent, Glasgow, Scotland.

AUTHOR INDEX

Author's names are indexed by section number and item number rather than by page. The numerals and letters preceding the hyphen refer to the section; the numerals following the hyphen refer to the number of the literature listing.

A

Abanov, L. V. 9-40
Abbott, H. G. 20C-1
Abel, Louis 3B-69, 9-242
Abele, J. B. 18B-54
Abelés, Florin 11-149
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